Exhibit 1

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Attorneys for Plaintiff
GEOVECTOR CORPORATION

UNITED STATED DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

SAN FRANCISCO DIVISION

GEOVECTOR CORPORATION, a California corporation,

Plaintiff;

v.

SAMSUNG INTERNATIONAL, INC., a New Jersey corporation;
SAMSUNG ELECTRONICS CO., LTD., a Korean corporation;
SAMSUNG ELECTRONICS AMERICA, INC., a New York corporation;
SAMSUNG TELECOMMUNICATIONS AMERICA, LLC, a Delaware limited liability company;
SAMSUNG RESEARCH AMERICA, INC. a California corporation,

Defendants.

Case No. 4:16-cv-04263-WHO

PLAINTIFF'S DISCLOSURE OF ASSERTED CLAIMS AND INFRINGEMENT CONTENTIONS

DISCLOSURE OF ASSERTED CLAIMS AND INFRINGEMENT CONTENTIONS

Pursuant to the Local Patent Rules, Plaintiff GeoVector Corporation (hereinafter "GeoVector" or "Plaintiff") provides the following Initial Infringement Contentions against Samsung International, Inc., Samsung Electronics Co., Ltd. ("SEC"), Samsung Electronics America, Inc. ("SEA"), and Samsung Telecommunications America, LLC ("STA"), and Samsung Research America, Inc. (hereinafter "Samsung" or "Defendants"). These contentions are preliminary. GeoVector reserves the right to supplement these disclosures and contentions as appropriate based on further discovery.

A. Claims of Each Patent In Suit that Are Infringed Upon by Defendants

Here is each claim of each patent in suit that is infringed by defendants, including for each claim the applicable statutory subsections of 35 U.S.C. § 271.

1. Patent No. 6037936 (the "'936 Patent")

a. Claim 1 (applicable § 271 subsections: a, b & c)

Claim No. 1 reads:

> A graphical user interface for a computer vision system, the computer vision system having a camera with an optical axis, a computer, position and attitude determining means, and a display having a display field normally aligned to the optical axis, said graphical user interface being comprised of:
>
> a field region; and
>
> a periphery,
>
> said field region being an area fractional portion of the display field enclosed by
>
> said periphery operable for displaying image and graphical information while a scene is being addressed by said computer vision system.

b. Claim 20 (applicable § 271 subsections: a, b & c)

Claim No. 20 reads:

> An apparatus including the combination of a computer vision system with a graphical user interface comprised of:
>
> a camera;
>
> a display;
>
> an attitude determining means;

a position determining means;

a computer; and

a graphical user interface,

said camera having an optical axis and an image plane whereby an image of a scene being addressed by the computer vision system is formed in the image plane when the optical axis is pointed into the direction of the scene;

said display having a planar image field with a normal direction associated therewith, the normal direction being aligned with the optical axis of said camera, or alternatively aligned with an angular offset;

said attitude determining means having a reference direction colinear with the optical axis of said camera;

said position determining means having a reference point co-located with the intersection of the planar image field and the reference direction of the attitude determining means;

said computer being electronically coupled to said camera, said display, said attitude determining means, and said position determining means;

said graphical user interface having a field region and a periphery bounding the field region, the field region being a fractional portion of the planar image field of the display.

c. Claim 22 (applicable § 271 subsections: a, b & c)

Claim No. 22 reads:

An apparatus for generating graphical user interfaces comprising:

an attitude determining means;

a position determining means;

a computer;

a graphics generator; and

a display,

said computer being electronically coupled to said display, graphics generator, and attitude and position determining means,

said graphics generator being responsive to said attitude and position determining means.

d. Claim 23 (applicable § 271 subsections: a, b & c)

Claim No. 23 reads:

A method of displaying a graphical user interface in a computer vision system comprising the steps:

addressing a scene with a computer vision system;

forming an image of the scene;

generating a graphical user interface;

combining the image of the scene with the graphical user interface to form a composite image; and

displaying the composite image in a display field.

2. Patent No. 7301536 (the "'536 Patent")

a. Claim No. 1 (applicable § 271 subsections: a, b & c)

Claim No. 1 reads:

An image processing system comprising:

a data processor;

an information delivery mechanism coupled to the processor, Wherein the information delivery mechanism delivers real scene image information to the data processor;

a real time position device identifying a position of at least a portion of the image processing system, Wherein the position identifies information enhancing the real scene image information;

a graphic processor coupled to the data processor for processing and combining the information enhancing the real scene image information with the real scene image information to produce an augmented real scene image for viewing; and

a display for showing the augmented real scene image that is provided in visual proximity of the position identified by the real time position device.

b. Claim 2 (applicable § 271 subsections: a, b & c)

Claim No. 2 reads: "The system of claim 1, Wherein the real time position device includes a global positioning device."

c. Claim 3 (applicable § 271 subsections: a, b & c)

Claim No. 3 reads: "The system of claim 2, Wherein the real time position device includes a Global Positioning System device."

d. Claim 4 (applicable § 271 subsections: a, b & c)

Claim No. 4 reads: "The system of claim 2, Wherein the real time position device includes a differential Global Positioning System device."

e. Claim 5 (applicable § 271 subsections: a, b & c)

Claim No. 5 reads: "The system of claim 2, Wherein the real time position device includes a Global Navigational Satellite System device."

f. Claim 6 (applicable § 271 subsections: a, b & c)

Claim No. 6 reads,

An image processing system comprising:

a data processor;

an information delivery mechanism coupled to the processor, wherein the information delivery mechanism delivers real scene image information to the data processor;

an attitude device identifying an attitude of at least a portion of the image processing system, wherein the attitude identifies information enhancing the real scene image information;

a graphic processor coupled to the data processor for processing and combining the information enhancing the real scene image information with the real scene image information to produce an augmented real scene image for viewing; and

a display showing the augmented real scene image that is provided in visual proximity of the attitude corresponding to the real scene image information.

g. Claim 7 (applicable § 271 subsections: a, b & c)

Claim No. 7 reads, "The system of claim 6, Wherein the attitude device includes a magnetometer."

3. Patent No. 7916138 (the "'138 Patent")

a. Claim No. 1 (applicable § 271 subsections: a, b & c)

Claim No. 1 reads:

An image processing system comprising:

a real time position device identifying a geographical position of at least a portion of the image processing system, wherein the geographical position identifies information that enhances real scene image information at the geographical position;

a graphic processor for processing and combining the information that enhances the real scene image information with the real scene image information to produce an augmented real scene image for viewing; and

a display for showing the augmented real scene image that is produced in visual proximity of the geographical position identified by the real time position device.

b. Claim No. 2 (applicable § 271 subsections: a, b & c)

Claim No. 2 reads: "The system of claim 1, wherein the real time position device includes a global positioning device."

c. Claim No. 3 (applicable § 271 subsections: a, b & c)

Claim No. 3 reads: "The system of claim 2, wherein the real time position device includes a Global Positioning System device."

d. Claim No. 4 (applicable § 271 subsections: a, b & c)

Claim No. 4 reads: "The system of claim 2, wherein the real time position device includes a differential Global Positioning System device."

e. Claim No. 5 (applicable § 271 subsections: a, b & c)

Claim No. 5 reads: "The system of claim 2, wherein the real time position device includes a Global Navigational Satellite System device."

f. Claim No. 6 (applicable § 271 subsections: a, b & c)

Claim No. 6 reads: "The system of claim 1 further comprising a database for storing the information that enhances real scene image information."

g. Claim No. 7 (applicable § 271 subsections: a, b & c)

Claim No. 7 reads: "The system of claim 6 wherein the information stored in the database is identified by geographical position."

h. Claim No. 8 (applicable § 271 subsections: a, b & c)

Claim No. 8 reads: "the system of claim 1 further comprising an attitude device identifying an attitude of said portion of the image processing system."

i. Claim No. 9 (applicable § 271 subsections: a, b & c)

Claim No. 9 reads: "The system of claim 8 further comprising a database for storing information that enhances real scene image information."

j. Claim No. 10 (applicable § 271 subsections: a, b & c)

Claim No. 10 reads: "The system of claim 9 wherein the information that is stored in the database is identified by geographical position and attitude."

k. Claim No. 11 (applicable § 271 subsections: a, b & c)

Claim No. 11 reads:

An image processing system comprising:

an attitude device identifying an attitude of at least a portion of the image processing system, wherein the attitude identifies information that enhances real scene image information at the device;

a graphic processor for processing and combining the information that enhances real scene image information with the real scene image information to produce an augmented real scene image for viewing; and

a display showing the augmented real scene image that is produced in visual proximity of the attitude device.

l. Claim No. 12 (applicable § 271 subsections: a, b & c)

Claim No. 12 reads: "The system of claim 11, wherein the attitude device includes a magnetometer."

m. Claim No. 13 (applicable § 271 subsections: a, b & c)

Claim No. 13 reads: "The system of claim 11 further comprising a database for storing the information that enhances real scene image information."

n. Claim No. 14 (applicable § 271 subsections: a, b & c)

Claim No. 14 reads: "The system of claim 13 wherein the information stored in the database is identified by attitude."

o. Claim No. 15 (applicable § 271 subsections: a, b & c)

Claim No. 15 reads: "The system of claim 11 further comprising a real time position device for identifying a geographical position of said portion of the image processing system."

p. Claim No. 16 (applicable § 271 subsections: a, b & c)

Claim No. 16 reads: "The system of claim 15 further comprising a database for storing information that enhances real scene image information."

q. Claim No. 17 (applicable § 271 subsections: a, b & c)

Claim No. 17 reads: "The system of claim 16 wherein the information stored in the database is identified by geographical position and attitude."

r. Claim No. 18 (applicable § 271 subsections: a, b & c)

Claim No. 18 reads:

An image processing system comprising:

a real time position device identifying a geographical position of at least a portion of the image processing system, wherein the geographical position identifies information that enhances real scene image information at the geographical position;

an attitude device identifying an attitude of at least a portion of the image processing system, wherein the attitude identifies information that enhances real scene image information at the device;

a database for storing information identified by geographical position and attitude that enhances real scene information at the geographical position;

a graphic processor for processing and combining the information retrieved from the database that enhances the real scene image information with the real scene image information to produce an augmented real scene image for viewing; and

a display for showing the augmented real scene image that is produced in visual proximity of the geographical position identified by the real time position device.

B. Each Infringing Apparatus, Product, Device, Process, Method or Other Instrumentality

See the chart attached hereto as **Exhibit A** which is incorporated herein by reference as if its contents were stated in full here.

C. Chart Identifying Specifically Where Each Limitation is Found

See the chart attached hereto as **Exhibit A** which is incorporated herein by reference as if its contents were stated in full here.

D. Indirect Infringement

The affirmative acts by Defendants, and each of them, of making, using and selling products that infringe the Patents-in-Suit, causing those products to be manufactured and distributed, and providing instruction manuals for those products, have induced and continue to induce manufacturers, resellers, and/or end-users to make or use those products in their normal and customary way to infringe the Patents-in-Suit. Defendants, and each of them, specifically intended and were aware that these normal and customary activities would infringe on the Patents-in-Suit. Defendants, and each of them, performed the acts that constitute induced infringement, and would induce actual infringement, with the knowledge of the patents, and with the knowledge, or willful blindness to the probability, that the induced acts would constitute infringement.

The Defendants, and each of them, have infringed and have induced infringement of the Patents-in-Suit.

The Defendants, and each of them, deliberately incorporated technologies claimed in the GeoVector patents into their products, and provided these technologies to a number of customers and third-party application developers through the Samsung App Store, who incorporated these technologies into their own products and which they use in the daily course of business with no authorization, and without entering into a commercial license agreement with GeoVector.

Without entering into a commercial license with, or without otherwise having authorization from, GeoVector, the Defendants, and each of them, are in violation of 35 U.S.C. §271 (b), because they knowingly aided, abetted, and actively induced others to infringe on GeoVector's patents by using or distributing stolen and licensed copies of technology that infringes upon GeoVector's patents.

The Defendants, and each of them, have committed contributory infringement on GeoVector's exclusive rights, which has damaged and will continue to damage GeoVector's business. The Defendants, and each of them, engaged in willful contributory infringement of GeoVector's patents, which is the direct and proximate cause of damages to GeoVector, and GeoVector is entitled to compensatory damages in an amount to be determined at trial.

E. Literal & Equivalent Presence

The limitations are literally present in each infringing device. Alternatively, the limitations are present under the doctrine of equivalents. See also the chart attached hereto as **Exhibit A** which is incorporated herein by reference as if its contents were stated in full here.

F. Priority Dates

The priority date for each of the patents in suit is September 10, 1993.

G. Apparatus, Device or Other Instrumentality

The World Surfer device incorporates all of GeoVector's claims.

H. Willful Infringement

Starting in calendar year 2000, GeoVector approached numerous cell phone and device manufacturers to discuss the licensing of GeoVector patents and the development of consumer products that would utilize the Trade Secrets and Confidential Information associated with the GeoVector Augmented Reality Technologies. Among the companies that GeoVector approached were the Samsung Defendants.

In December 2002 Samsung visited GeoVector. GeoVector produced a confidential slide deck demonstrating the possibility of integrating GeoVector technology into Samsung handsets such as the Samsung SPH-i330.

On July 19, 2006, Samsung met with GeoVector at GeoVector's offices in San Francisco to further discuss the possibility of integrating GeoVector Augmented Reality Technologies with Samsung's mobile device platforms.

In August 2006, GeoVector sent a confidential briefing to Samsung regarding the use and integration of GeoVector technology in Samsung smart phone handsets.

On August 16, 2006, GeoVector met with Samsung at Samsung's Headquarters in Seoul, South Korea. For this meeting, Samsung produced a set of slides marked "SAMSUNG CONFIDENTIAL", which stated that "We feel that GeoVector enabled devices make existing location based content more accessible through pointing as well as create a whole new genre of pointing enabled applications (with patent technology)."

On August 23, 2006, GeoVector sent Samsung a licensing and partnership proposal, attached hereto as part of **Exhibit C**. GeoVector proposed that:

1. Samsung will receive a world-wide, non-exclusive, perpetual (subject to the retention terms of paragraph 5 below) license (the License) to produce and sell all GeoVector enabled devices other than those that connect to GeoVector servers via Telco (GV Direct devices). i.e. the License will be for all GV devices that connect to the web without going through a Telco.

2. Samsung will be GeoVector's world-wide preferred partner for GV Direct devices.

3. Samsung will pay GeoVector an upfront license fee of $5 million (US$).

4. For years 2 and 3 of the License Samsung guarantees a minimum GV Direct device royalty revenue to GeoVector of $500,000 a quarter.

5. To the retain the License after year 3 Samsung will yearly, before the onset of the final quarter of the current license year, guarantee a minimum GV Direct device royalty revenue to GeoVector of $750,000 a quarter. If Samsung fails to commit to this guarantee before the onset of the final quarter of the license year then the License will terminate as of the end of the current license year.

6. Samsung will pay GeoVector a royalty of 5% of the value of any GV Direct devices sold.

In September 2006, GeoVector sent further confidential briefing to Samsung regarding potential applications of GeoVector technology in Samsung devices. GeoVector proposed using its sensor-based augmented reality technology to provide enhanced views of the 2008 Beijing Olympics, and using its pointing technology to provide tourists with relevant information regarding landmarks and attractions.

On February 12, 2008, GeoVector and STA executed a Mutual Nondisclosure Agreement.

On April 8, 2008, GeoVector sent a further business proposal to Samsung.

Despite extensive (now proven to be pretextual) negotiations and numerous substantial (and now proven to be misleadingly deceptive) communications, Samsung did not accept any of GeoVector's proposals. Furthermore, Samsung never reached a licensing agreement with, nor did it obtain other authorization from, GeoVector. However, this did not stop Defendants, and each of them, from unilaterally taking advantage of the trust and confidence that the Ellenby Family in particular, and GeoVector in general, placed in Defendants, and each of them.

The patent infringement by Defendants, and each of them, was and is willful. Defendants met with GeoVector numerous times between 2000 and 2008, and received briefings,

presentations, and proposals. These documents all included the GeoVector patent numbers, and Samsung's own documents reference the GeoVector patent portfolio. Therefore, the Defendants, and each of them, actually knew or reasonably should have known, at least as early as 2006, if not much earlier, of the existence of the GeoVector patents which they did not have a commercial license or any right to use. Defendants, and each of them, did in fact make, use, sell, offer to sell, and/or import within the United States, without authority, products with the innovations described in the GeoVector patents. Those products infringe on those patents. At no time from did Defendants ever obtain a commercial license or other permissions from GeoVector. The Defendants, and each of them, were on actual notice before the filing of this lawsuit, and were on inquiry long before.

Attached hereto as **Exhibit C** are documents that support GeoVector's assertions that Samsung willfully infringed on GeoVector's patents.

Dated: November 2, 2016

Respectfully submitted,
COMPUTERLAW GROUP LLP

By: */s/ Christopher Sargent*
Jack Russo
Christopher Sargent

Attorneys for Plaintiff
GEOVECTOR CORPORATION

EXHIBIT A

EXHIBIT A

Chart for '936 Patent

Claim No.	Language of Claim	Samsung Infringing Devices (Patent LR 3-1(b))	Location of Each Limitation (Patent LR 3-1(c))
1	A graphical user interface for a computer vision system, the computer vision system having a camera with an optical axis, a computer, position and attitude determining means, and a display having a display field normally aligned to the optical axis, said graphical user interface being comprised of:	Samsung infringing products include the Galaxy S product line (smart phones), and the Galaxy Note and Galaxy Tab product lines, sold within the United States. The infringing products, currently known or believed to infringe, are listed below. Samsung's smart phones have infringed on GeoVector's patents. As used herein, "smartphones" includes devices that have a 1. Screen; 2. Camera; 3. Processor capable of handling numeric and graphic information; 4. A compass; and 5. An accelerometer.	The location of this limitation is in the video capability of the devices, together with the software and apps that operate that capability. Each of these infringing products contain a computer vision system with a graphical user interface. The location of this limitation is in the devices' video capability. Each of the cameras in the infringing products has an optical axis which is the line through the center of the lens perpendicular to the body of the phone (equivalently under Local Patent Rule 3-1(e), the large front and back planar faces where the front face comprises the display surface). Each infringing product also contains a computer, which is in parenthesis below: -Galaxy i7500 (Qualcomm MSM7200A; 528 MHz ARM 11) -Galaxy Lite/Spica/Portal i5700 (800 MHz Samsung S3C6410)

Claim No.	Language of Claim	Samsung Infringing Devices (Patent LR 3-1(b))	Location of Each Limitation (Patent LR 3-1(c))
		GeoVector is informed and believes that, ever since Samsung started shipping tablets in 2010, and its tablet sales through 2013, all contained the above five functions. As a result, all of Samsung's tablets in that time period infringe on GeoVector's rights. Examples of certain smartphone models that infringe (with rear-facing camera specifications in parenthesis) include: -Galaxy i7500 (5 megapixels ("MP")) -Galaxy Lite/Spica/Portal i5700 (3.15 MP) -Galaxy S Captivate/Vibrate… i9000 (5 MP) -Galaxy 3/Apollo/Mini i5800 (3.15 MP) -Galaxy Beam/Halo i8520 (8 MP)	-Galaxy S Captivate/Vibrate… i9000 (Hummingbird 1GHz Cortex – A8) -Galaxy 3/Apollo/Mini i5800 (Samsung S5P6422) -Galaxy Ace GT-S5830 (800 MHz Qualcomm MSM 7227) -Galaxy Fit S5670 (600 MHz Qualcomm MSM 7227) -Galaxy Gio GT S5660 (800 MHz Qualcomm MSM 7227) -Galaxy Mini GT S5570 (600 MHz Qualcomm MSM 7227) -Galaxy Pro B7510 (800 MHz Qualcomm MSM 7227) -Galaxy S II, Skyrocket, Captivate Glide, Epic Touch 4G i9100; variations (Dual core 1.2 GHz Cortex A9) -Galaxy Exhibit 4G T759 (Samsung Intrinsity S5PC110 Hummingbird 1GHz Cortex A8) -Galaxy Nexus i9250 (Dual core 1.2 GHz Cortex A9) -Galaxy Pro Duos B5512 (832 MHz Broadcom BCM21553) -Galaxy S III (Quad core 1.4 GHz Cortex A9 or Dual core 1.5 GHz QC Krait) -Galaxy Note N7000 (Dual core 1.4 GHz Cortex A9) -Galaxy Note N7100 (Quad core 1.6 GHz Cortex A9) -Galaxy Tab series (Hummingbird 1GHz Cortex – A8) -Galaxy Tab 2 series (Dual core 1 GHz) The Qualcomm MSM chipsets each contain an ARM processor in addition to a graphic processor, cellular telephone functionality, and GPS and/or Assisted-GPS functionality.

Claim No.	Language of Claim	Samsung Infringing Devices (Patent LR 3-1(b))	Location of Each Limitation (Patent LR 3-1(c))
		-Galaxy Europa/550/5 i5500 (2 MP) -Galaxy Ace GT-S5830 (5 MP) -Galaxy Fit S5670 (5 MP) -Galaxy Gio GT S5660 (3.15 MP) -Galaxy Mini GT S5570 (3.15 MP) -Galaxy Prevail SPH-M820 (1.9 MP) -Galaxy Pro B7510 (3.15 MP) -Galaxy S II, Skyrocket, Captivate Glide, Epic Touch 4G i9100; variations (8 MP) -Galaxy Exhibit 4G T759 (3.15 MP) -Galaxy Nexus i9250 (5 MP) -Galaxy Pro Duos B5512 (3.15 MP) -Galaxy S III (8 MP) -Galaxy Note N7000 (8 MP) -Galaxy Note N7100 (8 MP)	All of the infringing products are reported to support either GPS or Assisted-GPS (AGPS) capability, or both. In some cases, the particular chipsets supporting this capability have been reported in the open literature. For example: Galaxy i7500 (MSM 7200A Galaxy S Captivate/Vibrate.. (BCM 4751) Galaxy Ace GT-S5830 (MSM 7227) Galaxy Gio GT S5660 (MSM 7227-1) Galaxy Mini GT S5570 (MSM 7227) Galaxy S II, Skyrocket, Captivate Glide, Epic Touch 4G i9100; variations (Qualcomm QSC6085) Galaxy Nexus i9250 (SiRF SiRFstarIV GSD4t) Galaxy S III (BCM 47511 or MSM 8960) In addition to GPS, reports in the open literature indicate that the Note, Note II, Galaxy S III, Galaxy S III Mini, and Galaxy S4 have GLONASS capability (GLONASS is the Russian Federation equivalent to GPS). In addition to GPS and GLONASS, phones and devices operating on CDMA networks (at least) typically support alternative means of position determination such as "Advanced Forward Link Trilateration" (AFLT). All infringing products also contain an attitude determining means. This is at least an accelerometer. In addition, all of the infringing devices contain a magnetometer or compass.

Claim No.	Language of Claim	Samsung Infringing Devices (Patent LR 3-1(b))	Location of Each Limitation (Patent LR 3-1(c))
		-Galaxy Tab series (3.15 MP) -Galaxy Tab 2 series (3 MP) -Galaxy U -Galaxy 551 -Galaxy SL (GT-I9003) -Galaxy Neo -Galaxy Z -Galaxy S Plus (GT-i9001) -Galaxy R (I9103) -Galaxy W (I8150) -Galaxy M -Galaxy Y (GT-S5360) -Galaxy Precedent -Galaxy Xcover (S5690) -Stratosphere -Galaxy Y Pro Duos (GT-B5510) -Galaxy Ace Plus (GT-S7500[L/T/W]) -Galaxy Ace 2 (GT-I8160) -Galaxy Mini 2 (GT-S6500) -Galaxy Y DUOS (GT-S6102) -Galaxy Rugby Smart (SGH-i847)	Each infringing device also contains a display with a display field normally aligned to the optical axis of the camera (the computer vision system). The display field is the front face of the phone or tablet/phablet, which is perpendicular (normal) to the optical axis of the camera.

Claim No.	Language of Claim	Samsung Infringing Devices (Patent LR 3-1(b))	Location of Each Limitation (Patent LR 3-1(c))
		-Galaxy Pocket (GT-S5300) -Galaxy Rugby (GT-S5690M) -Galaxy S Advance -Galaxy Appeal (SGH-I827) -Galaxy Ch@t (GT-B5330) -Galaxy Stellar (SCH-I200) -Galaxy S Duos (GT-S7562) -Galaxy Pocket Duos (GT-S5302) -Galaxy Victory 4G LTE (SPH-L300) -Galaxy Reverb -Galaxy Note II -Galaxy S Relay 4G -Galaxy Rush -Galaxy Express -Galaxy Rugby Pro (SGH-I547) -Galaxy S III Mini (GT-I8190) -Galaxy Pocket Plus (GT-S5301)	

Claim No.	Language of Claim	Samsung Infringing Devices (Patent LR 3-1(b))	Location of Each Limitation (Patent LR 3-1(c))
		-Galaxy S II Plus (GT-I9105) -Galaxy Grand (GT-I9080) -Galaxy Young (GT-S6310) -Galaxy Xcover 2 (GT-S7710) -Galaxy S4 (GT-I9500) -Galaxy Fame (GT-S6810) -Galaxy Mega -Galaxy Win (GT-I8550) -Galaxy Y Plus (GT-S5303) -Galaxy Core (GT-S8262) -Galaxy Star (GT-S5280) -Galaxy Pocket Neo (GT-S5310) -Galaxy Ace 3 (GT-S7270) -Galaxy S4 Zoom (SM-C1010) -Galaxy S4 Active (GT-I9295) -Galaxy S4 Mini (GT-I9190) -Galaxy Gear -Galaxy Note 3	

Claim No.	Language of Claim	Samsung Infringing Devices (Patent LR 3-1(b))	Location of Each Limitation (Patent LR 3-1(c))
		-Galaxy Core Plus (SM-G3500) -Galaxy Light (SGH-T399) -Galaxy Fame Lite (GT-S6790) -Galaxy Trend Lite (GT-S7390) -Galaxy Round (SM-G9105) -Galaxy Express 2 (SM-G3815) -Galaxy Star Pro (GT-S7260) -Galaxy Grand 2 (SM-G7100) -Galaxy Trend Plus (GT-S7580) -Galaxy S Duos 2 (GT-S7582) -Galaxy J (SGH-N075) -Galaxy Win Pro (SM-G3812) Samsung has also introduced a line of lower-cost phablets under the generic name “Tab”. The original Tab (7.0) was	

Claim No.	Language of Claim	Samsung Infringing Devices (Patent LR 3-1(b))	Location of Each Limitation (Patent LR 3-1(c))
		introduced in Sept. 2010. Larger versions (7.7, 8.9 and 10.1 inches) were introduced later. A second line (Tab 2 7.0 and 10.1) was also introduced.	
a. b.	a field region; and a periphery,	Please see claim 1 of the '936 Patent above.	The '936 specification defines a field region as a two-dimensional area with arbitrary boundary. (8:34-35). A graphical user interface (GUI) generally exists as a field region in an image. (8:37-38). The specification states: "A graphical user interface of the invention includes a field region. The field region occupies a fractional portion of the display field. The field region is bounded by a periphery. Some boundaries of the field region may be coincident with boundaries of a display field. A graphical user interface may be arranged to contain information including graphics and images." (10:25-31) Furthermore, the specification states that: Information inside the field region typically belongs to the graphical user interface and information outside is mostly independent of the graphical user interface operation and may belong to a more general computer application, usually the vision system. Information within the graphical user interface may include, text, video, control buttons, meters, indicia, "transparent" fields, graphics, maps, color, desktop objects, among others. (10:50-57)

Claim No.	Language of Claim	Samsung Infringing Devices (Patent LR 3-1(b))	Location of Each Limitation (Patent LR 3-1(c))
			The infringing devices have a variety of graphical user interfaces each comprising a field region and periphery. These include a radar-like field region and periphery, various touch-sensitive "buttons", and a combined text/graphics field giving extra information relating to a selected point of interest (among others). The graphical user interfaces (GUIs) in the Layar and other applications, such as those listed in Exhibit B, which come pre-loaded on the infringing devices, are the location of this limitation.
c.	said field region being an area fractional portion of the display field enclosed by said periphery operable for displaying image and graphical information while a scene is being addressed by said computer vision system.	Please see claim 1 of the '936 Patent above.	The infringing devices contain displays and software that can show each field region as a fraction of the display field, which is enclosed by a periphery. In some cases, the field regions are translucent and indicate a portion of the real scene image along with other information. In other cases, the field regions are opaque and contain other forms of image and graphical information. In either case, the image and graphical information is being displayed while a real scene is being addressed by the computer vision system.
20.	An apparatus including the combination of a computer vision	Please see claim 1 of the '936 Patent above.	The infringing devices contain a combination of a computer vision system and a graphical user interface. See also claim 1.

Claim No.	Language of Claim	Samsung Infringing Devices (Patent LR 3-1(b))	Location of Each Limitation (Patent LR 3-1(c))
	system with a graphical user interface comprised of:		
a.	a camera;	Please see claim 1 of the '936 Patent above.	See claim 1.
b.	a display;	Please see claim 1 of the '936 Patent above.	The infringing devices contain a combination of a computer vision system and a graphical user interface. See also claim 1.
c.	an attitude determining means;	Please see claim 1 of the '936 Patent above.	See claim 1.
d.	a position determining means;	Please see claim 1 of the '936 Patent above.	See claim 1.
e.	a computer; and	Please see claim 1 of the '936 Patent above.	See claim 1.
f.	a graphical user interface;	Please see claim 1 of the '936 Patent above.	The infringing devices contain a combination of a computer vision system and a graphical user interface. See also claim 1.
g.	said camera having an optical axis and an image plane whereby an image of a scene being addressed by the computer vision system is formed in the image plane when the optical axis	Please see claim 1 of the '936 Patent above.	The optical axis is the line passing through the center of the lens and perpendicular (normal) to the body of the cameras in the infringing devices. When the optical axis is pointed into the direction of a scene, an image of the scene (within the limits of the field of view of the computer vision system) is formed on the image plane (the sensor within the camera that responds to photons). See also claim 1.

Claim No.	Language of Claim	Samsung Infringing Devices (Patent LR 3-1(b))	Location of Each Limitation (Patent LR 3-1(c))
	is pointed into the direction of the scene;		
h.	said display having a planar image field with a normal direction associated therewith, the normal direction being aligned with the optical axis of said camera, or alternatively aligned with an angular offset;	Please see claim 1 of the '936 Patent above.	With the exception of the Samsung Galaxy Nexus, the displays of the accused devices are planar and the normal direction of the planar image field is perpendicular to the surface of the display and is parallel (aligned with) the optical axis of the camera. The Nexus has a display that is curved a small amount.
i.	said attitude determining means having a reference direction co-linear with the optical axis of said camera;	Please see claim 1 of the '936 Patent above.	The infringing devices' three-axis attitude determination system is oriented with their primary axes aligned with the principal axes of the rectangular body of the devices' housing. The attitude determining means would then have a "reference direction" (a direction that is parallel to one of its axes) that is also parallel to the optical axis of the camera (said optical axis being perpendicular (normal) to the large faces of the rectangular body of the device).
j.	said position determining means having a reference point co-located with the intersection of the planar image	Please see claim 1 of the '936 Patent above.	The reference point of the position determining means is the GPS antenna. Both the GPS antenna, and the planar image field of the camera (as well as the display) are within the roughly rectangular volume defined by the body of the device. The antenna is displaced relative to the image plane by less than half an inch. The reference

Claim No.	Language of Claim	Samsung Infringing Devices (Patent LR 3-1(b))	Location of Each Limitation (Patent LR 3-1(c))
	field and the reference direction of the attitude determining means;		direction of the attitude determining means is normal to the image plane (except in the case of the Nexus), and the intersection of the planar image field and the reference direction must also be located within the roughly rectangular volume defined by the body of the device. This intersection does not unambiguously define a single point – it could be anywhere within the image plane. Clearly, however, the GPS antenna cannot be further-away from this intersection than the largest diagonal dimension of the device – about 10.5 inches for the largest Galaxy Note infringing device. It would be possible to define the intersection of a line that is parallel to the reference direction, which passes through the GPS antenna, and which intersects the image plane. Clearly, the GPS antenna cannot be further from this intersection point than 0.5 inches.
k.	said computer being electronically coupled to said camera, said display, said attitude determining means, and said position determining means;	Please see claim 1 of the '936 Patent above.	The computer (see claim 1) is coupled to the camera, display, attitude determining means and position determining means. This is inherent since the processor can access the associated information to perform an identified application such as the Layar and other applications, such as those listed in Exhibit B. For example, the Galaxy S III has a computer (Cortex9 Quad processor) connected to (i.e., electronically coupled to) the camera and display. It has a sensor that is an attitude determining means. This device can use a Broadcom BCM 47511 GPS chipset, which is known to be (and is inherently required to be) connected to the

Claim No.	Language of Claim	Samsung Infringing Devices (Patent LR 3-1(b))	Location of Each Limitation (Patent LR 3-1(c))
			computer in order to support an application such as the Layar and other applications, such as those listed in Exhibit B. A different version of the Galaxy S III relies on the Qualcomm MSM8960 which contains a dual core 1.5 GHz QC Krait CPU as well as self-contained GPS functionality. The rear-facing camera attaches to the right-hand portion of the motherboard. The S III uses ST's combination sensor, the LSM330DLC 3D accelerometer and 3D gyroscope, and the AKM8975 Electronic Compass.
1.	said graphical user interface having a field region and a periphery bounding the field region, the field region being a fractional portion of the planar image field of the display.	Please see claim 1 of the '936 Patent above.	See claim 1.
22.	An apparatus for generating graphical user interfaces comprising:	Please see claim 1 of the '936 Patent above.	All infringing devices can generate a graphical user interface (e.g., the home screen as well as the GUIs associated with the Layar and other applications, such as those listed in Exhibit B) and are therefore "apparatuses for generating graphical user interfaces." Layar is compatible with at least all Android 2.2 (and later) operating systems, and was also preloaded on some earlier Galaxy models such as the i5700, i5800, and the Galaxy S.

Claim No.	Language of Claim	Samsung Infringing Devices (Patent LR 3-1(b))	Location of Each Limitation (Patent LR 3-1(c))
			It is probably preloaded on all later Samsung smartphone systems with Android 2.2 and above, including all Galaxy S phones, Notes, and Tabs.
a.	an attitude determining means;	Please see claim 1 of the '936 Patent above.	All infringing devices contain an accelerometer that provides a vertical reference (among other things); all infringing (above, in claim 1) contain a magnetometer that provides a "North" reference as well as additional information to help stabilize the attitude information. For example, the S III uses ST's LSM330DLC 3D accelerometer and 3D gyroscope, and the AKM8975 Electronic Compass.
b.	a position determining means;	Please see claim 1 of the '936 Patent above.	All infringing devices contain a GPS-based position determining means (a GPS receiver), including: Galaxy i7500 (MSM 7200A Galaxy S Captivate/Vibrate.. (BCM 4751) Galaxy Ace GT-S5830 (MSM 7227) Galaxy Gio GT S5660 (MSM 7227-1) Galaxy Mini GT S5570 (MSM 7227) Galaxy S II, Skyrocket, Captivate Glide, Epic Touch 4G i9100; variations (Qualcomm QSC6085) Galaxy Nexus i9250 (SiRF SiRFstarIV GSD4t) Galaxy S III (BCM 47511 or MSM 8960)
c.	a computer;	Please see claim 1 of the '936 Patent above.	See claim 1.
d.	a graphics generator; and	Please see claim 1 of the '936 Patent above.	All infringing products listed above contain a graphics generator for generating the graphical user interface elements as well as combining the information with the real scene image information to produce an augmented real scene image for viewing.

Claim No.	Language of Claim	Samsung Infringing Devices (Patent LR 3-1(b))	Location of Each Limitation (Patent LR 3-1(c))
			In some cases, the graphics generator is contained within a general-purpose chip or chipset that also contains a general-purpose processor (CPU). For example, the Qualcomm MSM7200A, MSM 7227(-1), MSM7627 and MSM8960 (noted above) all contain graphic processor functionality in addition to a CPU. In other cases, the graphic processor is separate from the chip containing the GPS functionality (and possibly separate from the CPU). For example, the Galaxy S, Galaxy Exhibit 4G, and Galaxy Nexus rely on the PowerVR SGX540, which is a hardware accelerator design. The Galaxy S II and Galaxy S III rely on the Mali 400 MP, which is a multi-core graphic processing unit (GPU).
e.	a display	Please see claim 1 of the '936 Patent above.	See claim 1.
f.	said computer being electronically coupled to said display, graphics generator, and attitude and position determining means,	Please see claim 1 of the '936 Patent above.	The computer must be connected to the display, graphics generator, and attitude and position determining means for the device to take advantage of these hardware elements, and for the user to see the imagery and graphics.
g.	said graphics generator being responsive to said attitude and position determining means.	Please see claim 1 of the '936 Patent above.	In the the Layar and other applications, such as those listed in Exhibit B, the graphics generator is responsive to the attitude and position determining means because it adjusts the location of some of the on-screen icons (for example, the Points of Interest (POIs)), in response to the attitude and position of the device.

Claim No.	Language of Claim	Samsung Infringing Devices (Patent LR 3-1(b))	Location of Each Limitation (Patent LR 3-1(c))
23.	A method of displaying a graphical user interface in a computer vision system comprising the steps:	Please see claim 1 of the '936 Patent above.	All infringing devices support a method of displaying a graphical user interface in a computer vision system. For example, the devices can show a camera view along with a Layar graphical user interface containing touch-sensitive icons and controls. A person can hold up the device to a scene and see the screen as a subset of the scene, with a periphery containing controls in the screen.
a.	addressing a scene with a computer vision system;	Please see claim 1 of the '936 Patent above.	All infringing devices "address a scene with a computer vision system" by enabling an application that employs the camera, and pointing the camera at the scene.
b.	forming an image of the scene;	Please see claim 1 of the '936 Patent above.	An image of the scene is formed on the optical detector within the camera, and also on the screen.
c.	generating a graphical user interface;	Please see claim 1 of the '936 Patent above.	All infringing devices can generate a graphical user interface (see discussion above regarding images generated by the preloaded Layar application and other applications such as those listed in Exhibit B).
d.	combining the image of the scene with the graphical user interface to form a composite image; and	Please see claim 1 of the '936 Patent above.	All infringing devices can combine the image of a scene with the graphical user interface to form a composite image. The fact that this step is performed is clear from the images displayed in the Layar application and other applications, such as those listed in Exhibit B (see discussion above).
e.	displaying the composite image in a display field.	Please see claim 1 of the '936 Patent above.	All infringing devices can display a composite image in a display field. See the description above of the Layar and other applications, such as those listed in Exhibit B.

Chart for '536 Patent

Claim No.	Language of Claim	Samsung Infringing Devices (Patent LR 3-1(b))	Location of Each Limitation (Patent LR 3-1(c))
1.	An image processing system comprising:	Infringing products are within the Galaxy product line (smart phones), and the Galaxy Note and Tab product lines (sometimes called tablets or "phablets" if they are intermediate in size and functionality between a smart phone and a tablet), sold within the United States. The smart phones are listed below. All contain a camera, display, GPS & accelerometer. All include a compass. The Galaxy S II, S III and Nexus also contain gyros. The devices are listed in the order of date, model and operating system: -June 2009; Galaxy i7500; Android 1.6 Donut -November 2009; Galaxy Lite/Spica/Portal i5700; Android 2.1 Éclair	The location of the limitation is in the camera, display, GPS & accelerometer, together with software and computing power to make those items work together. All include a compass and they all contain video capability. The Galaxy S II, S III and Nexus also contain gyros. All infringing Tab devices contain camera, display, GPS, accelerometer, and compass. All listed products comprise an image processing system. The resolution of the rear-facing camera varies from 1.9 MP to 8 MP.

Claim No.	Language of Claim	Samsung Infringing Devices (Patent LR 3-1(b))	Location of Each Limitation (Patent LR 3-1(c))
		-June 2010; Galaxy S Captivate/Vibrate… i9000; Android 2.1 Éclair -July 2010; Galaxy 3/Apollo/Mini i5800; Android 2.1 Éclair -February 2011; Galaxy Ace GT-S5830; Android 2.2 Froyo -February 2011; Galaxy Fit S5670; Android 2.2 Froyo -March 2011; Galaxy Gio GT-S5660; Android 2.2.1 Froyo -March 2011; Galaxy Mini GT-S5570; Android 2.2 Froyo -April 2011; Galaxy Pro B7510; Android 2.2 Froyo -May 2011; Galaxy S II, Skyrocket Captivate Glide, Epic Touch 4G i9100, variations; Android 2.3.5 Gingerbread -June 2011; Galaxy Exhibit 4G T759; Android 2.3.5 Gingerbread	

Claim No.	Language of Claim	Samsung Infringing Devices (Patent LR 3-1(b))	Location of Each Limitation (Patent LR 3-1(c))
		-November 2011; Galaxy Nexus i9250; Android 4.0.1 Ice Cream Sandwich -January 2012; Galaxy Pro Duos B5512; Android 2.3.6 Gingerbread -May 2012; Galaxy S III; Android 4.0.1 Ice Cream Sandwich Please also see claim 1 of the '936 Patent above.	
a.	a data processor;	Please see claim 1 of the '536 and '936 Patents above.	All infringing products contain a data processor, certain of which are listed below (the processors are in parenthesis): -Galaxy i7500 (Qualcomm MSM 7200A; 528 MHz ARM 11) -Galaxy Lite/Spica/Portal i5700 (800 MHz Samsung S3C6410) -Galaxy S Captivate/Vibrate… i9000 (Hummingbird 1 GHz Cortex – A8 -Galaxy 3/Apollo/Mini i5800 (Samsung S5P6422) -Galaxy Ace GT-S5830 (800 MHz Qualcomm MSM 7227) -Galaxy Fit S5670 (600 MHz Qualcomm MSM 7227) -Galaxy Gio GT-S5660 (800 MHz Qualcomm MSM 7227) -Galaxy Mini GT-S5570 (600 MHz Qualcomm MSM 7227) -Galaxy Pro B7510 (800 Qualcomm MSM 7227)

Claim No.	Language of Claim	Samsung Infringing Devices (Patent LR 3-1(b))	Location of Each Limitation (Patent LR 3-1(c))
			-Galaxy S II, Skyrocket Captivate Glide, Epic Touch 4G i9100, variations (Dual core 1.2 GHz Cortex A9) -Galaxy Exhibit 4G T759 (Samsung Intrinsity S5PC110 Hummingbird 1GHz Cortex A8) -Galaxy Nexus i9250 (Dual core 1.2 GHz Cortex A9) -Galaxy Pro Duos B5512 (832 MHz Broadcom BCM21553) -Galaxy S III (Quad core 1.4 GHz Cortex A9 or Dual core 1.5 GHz QC Krait) -Galaxy Note N7000 (Dual core 1.4 GHz Cortex A9) -Galaxy Note N7100 (Quad core 1.6 GHz Cortex A9) -Galaxy Tab series (Hummingbird 1 GHz Cortex – A8 -Galaxy Tab 2 series (Dual core 1 GHz)
b.	an information delivery mechanism coupled to the processor, wherein the information delivery mechanism delivers real scene image information to the data processor;	Please see claim 1 of the '536 and '936 Patents above.	Every infringing product contains a camera as a separate component, and inherently requires an interface or connector (an information delivery mechanism) coupled to the data processor to move image data to the data processor. For the Galaxy S III the camera probably has a Sony BSI sensor. At least some infringing products also have a hardware buffer. For example, the Galaxy Nexus rear-facing camera probably has a Winbond 8 Mb Serial Flash Memory unit in line to help it buffer all the data it collects.
c.	a real time position device identifying a position of at least a portion of the image processing system, wherein the	Please see claim 1 of the '536 and '936 Patents above.	All infringing products listed above have a GPS chipset (a real-time position device) that identifies the position of the phone or tablet; the position identifies (within suitable applications such as the Layar and other applications, such as those listed in Exhibit B) information which enhances the real scene image information.

Claim No.	Language of Claim	Samsung Infringing Devices (Patent LR 3-1(b))	Location of Each Limitation (Patent LR 3-1(c))
	position identifies information enhancing the real scene image information;		Examples of GPS chipsets include: -Galaxy i7500 (MSM 7200A) -Galaxy S Captivate/Vibrate… (BCM 4751) -Galaxy Ace GT-S5830 (MSM 7227) -Galaxy Gio GT-S5660 (MSM 7227-1) -Galaxy Mini GT S5570 (MSM 7227) -Galaxy S II, Skyrocket, Captivate, Glide, Epic Touch 4G i9100; variations (Qualcomm QSC6085 -Galaxy Nexus i9250 (SiRFstarIV GSD4t) -Galaxy S III (BCM 47511 or MSM8960) Layar is pre-loaded on the infringing products listed above; other applications that may use position information, to identify enhancing the real scene information, may also be pre-installed or available from Samsung or via third parties. See the applications listed in Exhibit B.
d.	a graphic processor coupled to the data processor for processing and combining the information enhancing the real scene image information with the real scene	Please see claim 1 of the '536 and '936 Patents above.	All infringing products listed above contain a graphic processor, coupled to the data processor, for processing and combining the information enhancing the real scene image information with the real scene image information to produce an augmented real scene image for viewing. In some cases, the graphic processor is contained within a general-purpose chip or chipset that also contains a general-purpose processor (CPU). For example, the Qualcomm MSM7200A, MSM 7227(-1), MSM7627 and MSM8960 (noted in the limitation above) all contain graphic processor functionality in addition to a CPU.

Claim No.	Language of Claim	Samsung Infringing Devices (Patent LR 3-1(b))	Location of Each Limitation (Patent LR 3-1(c))
	image information to produce an augmented real scene image for viewing; and		In other cases, the graphic processor is separate from the chip containing the GPS functionality (and possibly separate from the CPU). For example, the Galaxy S, Galaxy Exhibit 4G, and Galaxy Nexus rely on the PowerVR SGX540, which is a hardware accelerator design licensed from Imagination Technologies. The Galaxy S II and Galaxy S III rely on the Mali 400 MP, which is a multi-core graphic processing unit (GPU). The graphic processors are coupled to the data processor because the two are required to exchange information. When running an augmented reality application such as the Layar and other applications, such as those listed in Exhibit B, in an operating scenario where an augmented reality scene is being displayed, the graphic processor (either contained in a general-purpose chip or a separate chip) is used to combine the information.
e.	a display for showing the augmented real scene image that is provided in visual proximity of the position identified by the real time position device.	Please see claim 1 of the '536 and '936 Patents above.	All the infringing products comprise a display which can show the augmented real scene image. This display, being part of the device which contains the camera and real-time position device (e.g., the GPS), is in visual proximity of the position identified by the real time position device. For example, the Galaxy Tab can be held up in Times Square and, when pointed at a historic sky scraper in that square, it will show additional information on its screen, based on the device's position relative to the buildings in that Square.
2.	The system of claim 1, wherein the real time position device	Please see claim 1 of the '536 and '936 Patents above.	Global positioning devices include GPS-capable and GLONASS-capable devices. All infringing Samsung

Claim No.	Language of Claim	Samsung Infringing Devices (Patent LR 3-1(b))	Location of Each Limitation (Patent LR 3-1(c))
	includes a global positioning device.		products contain at least a GPS-capable device. Examples of GPS chips used in infringing products include: -Galaxy i7500 (MSM 7200A) -Galaxy S Captivate/Vibrate… (BCM 4751) -Galaxy Ace GT-S5830 (MSM 7227) -Galaxy Gio GT-S5660 (MSM 7227-1) -Galaxy Mini GT-S5570 (MSM 7227) -Galaxy S II, Skyrocket, Captivate Glide, Epic Touch 4G i9100, variations (Qualcomm QSC6085) -Galaxy Nexus i9250 (SiRF SiRFstarIV GSD4t) -Galaxy S III (BCM 47511 or MSM 8960)
3.	The system of claim 2, wherein the real time position device includes a Global Positioning System device.	Please see claim 1 of the '536 and '936 Patents above.	The GPS receivers noted above all rely on the US/DoD Global Positioning System.
4.	The system of claim 2, wherein the real time position device includes a differential Global Positioning System device.	Please see claim 1 of the '536 and '936 Patents above.	The industry standards for Assisted GPS (A-GPS) provide for differential corrections to be sent to the mobile device, over both GSM and CDMA networks.
5.	The system of claim 2, wherein the real time position device includes a Global	Please see claim 1 of the '536 and '936 Patents above.	At least the following infringing products support Global Navigation Satellite System (GLONASS) navigation: Note, Note II, S III, S III mini, and S4. Additional Galaxy products may also support GLONASS, including the Chat, Grand, Music and Pocket.

Claim No.	Language of Claim	Samsung Infringing Devices (Patent LR 3-1(b))	Location of Each Limitation (Patent LR 3-1(c))
	Navigation Satellite System device.		
6.	An image processing system comprising:	Please see claim 1 of the '536 and '936 Patents above.	See claim 1.
a.	a data processor	Please see claim 1 of the '536 and '936 Patents above.	See claim 1.
b.	an information delivery mechanism coupled with the processor, wherein the information delivery mechanism delivers real scene image information to the data processor;	Please see claim 1 of the '536 and '936 Patents above.	See claim 1.
c.	an attitude device identifying an attitude of at least a portion of the image processing system, wherein the attitude identifies information enhancing the real scene image information;	Please see claim 1 of the '536 and '936 Patents above.	All infringing devices contain an accelerometer and magnetometer or digital compass. The accelerometer and magnetometer (or compass) comprise an attitude device identifying an attitude of the image processing system. The Layar and other applications, such as those listed in Exhibit B, use the attitude of the device to determine information enhancing the real scene information, and also to help display that information.

Claim No.	Language of Claim	Samsung Infringing Devices (Patent LR 3-1(b))	Location of Each Limitation (Patent LR 3-1(c))
d.	a graphic processor coupled to the data processor for processing and combining the information enhancing the real scene image information with the real scene image information to produce an augmented real scene image for viewing; and	Please see claim 1 of the '536 and '936 Patents above.	See claim 1.
e.	a display showing the augmented real scene image that is provided in visual proximity of the attitude corresponding to the real scene image information.	Please see claim 1 of the '536 and '936 Patents above.	See claim 1.
7.	The system of claim 6, wherein the attitude device includes a magnetometer.	Please see claim 1 of the '536 and '936 Patents above.	All infringing devices in claim 1, including the S4, Note product line, and Tab product line, contain either a "magnetometer" or a "digital compass". Plaintiff believes that a "digital compass" comprises a magnetometer. Hence, all accused devices satisfy this limitation.

Chart for '138 Patent

Claim No.	Language of Claim	Samsung Infringing Devices (Patent LR 3-1(b))	Location of Each Limitation (Patent LR 3-1(c))
1.	An image processing system comprising:	Infringing products are within the Galaxy product line (smart phones), and the Galaxy Note and Tab product lines (sometimes called tablets or "phablets" if they are intermediate in size and functionality between a smart phone and a tablet), sold within the United States. The smart phones are listed below. All include a compass. The Galaxy S II, S III and Nexus also contain gyros. The devices are listed in the order of date, model and operating system: -June 2009; Galaxy i7500; Android 1.6 Donut -November 2009; Galaxy Lite/Spica/Portal i5700; Android 2.1 Éclair	The location of the limitation in the smartphones is in the camera, display, GPS & accelerometer. All Tabs also contain the limitation in their camera, display, GPS, accelerometer, and compass. All infringing products comprise an image processing system.

Claim No.	Language of Claim	Samsung Infringing Devices (Patent LR 3-1(b))	Location of Each Limitation (Patent LR 3-1(c))
		-June 2010; Galaxy S Captivate/Vibrate… i9000; Android 2.1 Éclair -July 2010; Galaxy 3/Apollo/Mini i5800; Android 2.1 Éclair -February 2011; Galaxy Ace GT-S5830; Android 2.2 Froyo -February 2011; Galaxy Fit S5670; Android 2.2 Froyo -March 2011; Galaxy Gio GT-S5660; Android 2.2.1 Froyo -March 2011; Galaxy Mini GT-S5570; Android 2.2 Froyo -April 2011; Galaxy Pro B7510; Android 2.2 Froyo -May 2011; Galaxy S II, Skyrocket Captivate Glide, Epic Touch 4G i9100, variations; Android 2.3.5 Gingerbread -June 2011; Galaxy Exhibit 4G T759; Android 2.3.5 Gingerbread	

Claim No.	Language of Claim	Samsung Infringing Devices (Patent LR 3-1(b))	Location of Each Limitation (Patent LR 3-1(c))
		-November 2011; Galaxy Nexus i9250; Android 4.0.1 Ice Cream Sandwich -January 2012; Galaxy Pro Duos B5512; Android 2.3.6 Gingerbread -May 2012; Galaxy S III; Android 4.0.1 Ice Cream Sandwich Please also see claim 1 of the '536 and '936 Patents above.	
a.	a real time position device identifying a geographical position of at least a portion of the image processing system, wherein the geographical position identifies information that enhances real scene image information at the geographical position;	Please see claim 1 of the '138, '536 and '936 Patents above.	All infringing products listed above have a GPS chipset (a real-time position device) that identifies the position of the phone or tablet; the position identifies (within applications such as the Layar and other applications, such as those listed in Exhibit B) information which enhances real scene image information. Examples of GPS chips used in infringing products include: -Galaxy i7500 (MSM 7200A) -Galaxy S Captivate/Vibrate… (BCM 4751) -Galaxy Ace GT-S5830 (MSM 7227) -Galaxy Gio GT-S5660 (MSM 7227-1) -Galaxy Mini GT-S5570 (MSM 7227) -Galaxy S II, Skyrocket, Captivate Glide, Epic Touch 4G i9100, variations (Qualcomm QSC6085) -Galaxy Nexus i9250 (SiRF SiRFstarIV GSD4t)

Claim No.	Language of Claim	Samsung Infringing Devices (Patent LR 3-1(b))	Location of Each Limitation (Patent LR 3-1(c))
			-Galaxy S III (BCM 47511 or MSM 8960) The application Layar is pre-loaded on the infringing products listed above; other applications that may use the position information to identify enhancing the real scene information may also be pre-installed or available from Samsung or via third parties. See the applications listed in Exhibit B.
b.	a graphic processor for processing and combining the information that enhances the real scene image information with the real scene image information to produce an augmented real scene image for viewing; and	Please see claim 1 of the '138, '536 and '936 Patents above.	All infringing products listed above contain a graphic processor for processing and combine the information enhancing the real scene image information with real scene image information to produce an augmented real scene image for viewing. In some cases, the graphic processor is contained within a general-purpose chip or chipset. For example, the Qualcomm MSM7200A, MSM 7227(-1), MSM7627 and MSM8960 all contain graphic processor functionality. In other cases, the graphic processor is separate from the chip containing the GPS functionality. For example, the Galaxy S, Galaxy Exhibit 4G, and Galaxy Nexus rely on the PowerVR SGX540, a hardware accelerator design. The Galaxy S II and Galaxy S III rely on the Mali 400 MP, which is a multi-core graphic processing unit (GPU). When running an augmented reality (AR) application such as Layar or other similar AR applications such as those listed in Exhibit B, in an operating scenario where an augmented reality scene is being displayed, the graphic processor (either

Claim No.	Language of Claim	Samsung Infringing Devices (Patent LR 3-1(b))	Location of Each Limitation (Patent LR 3-1(c))
			contained in a general-purpose chip or a separate chip) is used to combine the information.
c.	a display for showing the augmented real scene image that is produced in visual proximity of the geographical position identified by the real time position device.	Please see claim 1 of the '138, '536 and '936 Patents above.	All the infringing products comprise a display which can show the augmented real scene image. This display, being part of the device which contains the camera and real-time position device (e.g., the GPS), is in visual proximity of the position identified by the real time position device. For example, the Galaxy Tab can be held up in Times Square and, when pointed at a historic sky scraper in that square, it will show additional information on its screen, based on the device's position relative to the buildings in that Square.
2.	The system of claim 1, wherein the real time position device includes a global positioning device.	Please see claim 1 of the '138, '536 and '936 Patents above.	Global positioning devices would include GPS-capable and GLONASS-capable devices. All infringing products are contain at least a GPS-capable device. GPS chips used in some accused products include: -Galaxy i7500 (MSM 7200A) -Galaxy S Captivate/Vibrate… (BCM 4751) -Galaxy Ace GT-S5830 (MSM 7227) -Galaxy Gio GT-S5660 (MSM 7227-1) -Galaxy Mini GT-S5570 (MSM 7227) -Galaxy S II, Skyrocket, Captivate Glide, Epic Touch 4G i9100, variations (Qualcomm QSC6085) -Galaxy Nexus i9250 (SiRF SiRFstarIV GSD4t) -Galaxy S III (BCM 47511 or MSM 8960)
3.	The system of claim 2, wherein the real time position device includes a Global	Please see claim 1 of the '138, '536 and '936 Patents above.	The GPS receivers noted above all rely on the US/DoD Global Positioning System.

Claim No.	Language of Claim	Samsung Infringing Devices (Patent LR 3-1(b))	Location of Each Limitation (Patent LR 3-1(c))
	Positioning System device.		
4.	The system of claim 2, wherein the real time position device includes a differential Global Positioning System device.	Please see claim 1 of the '138, '536 and '936 Patents above.	The industry standards for Assisted GPS (A-GPS) provide for differential corrections to be sent to the mobile device, over both GSM and CDMA networks.
5.	The system of claim 2, wherein the real time position device includes a Global Navigational Satellite System device.	Please see claim 1 of the '138, '536 and '936 Patents above.	At least the following infringing products support Global Navigation Satellite System (GLONASS) navigation: Note, Note II, S III, S III mini, and S4. Additional Galaxy products also support GLONASS, including the Chat, Grand, Music and Pocket.
6.	The system of claim 1 further comprising a database for storing the information that enhances real scene image information.	Please see claim 1 of the '138, '536 and '936 Patents above.	The database is either in the phone memory or at the application's server. Either way, the behavior of the application on the infringing products indicates that the database exists. The information that enhances the real scene information is delivered to the phone, and that implies that the information previously existed in a database at the server.
7.	The system of claim 6 wherein the information stored in the database is identified by	Please see claim 1 of the '138, '536 and '936 Patents above.	The information stored in the server's database is probably identified by geographical position.

Claim No.	Language of Claim	Samsung Infringing Devices (Patent LR 3-1(b))	Location of Each Limitation (Patent LR 3-1(c))
	geographical position.		
8.	the system of claim 1 further comprising an attitude device identifying an attitude of said portion of the image processing system.	Please see claim 1 of the '138, '536 and '936 Patents above.	All infringing devices in claim 1 contain an accelerometer and magnetometer or digital compass rigidly mounted in the phone. The accelerometer and magnetometer (or compass) represent an attitude device identifying an attitude of the image processing system (including the "said portion").
9.	The system of claim 8 further comprising a database for storing information that enhances real scene image information.	Please see claim 1 of the '138, '536 and '936 Patents above.	See claim 6.
10.	The system of claim 9 wherein the information that is stored in the database is identified by geographical position and attitude.	Please see claim 1 of the '138, '536 and '936 Patents above.	See claim 1 and 6.
11.	An image processing system comprising:	Please see claim 1 of the '138, '536 and '936 Patents above.	See claim 1.
a.	an attitude device identifying an attitude of at least a	Please see claim 1 of the '138, '536 and '936 Patents above.	See claim 8.

Claim No.	Language of Claim	Samsung Infringing Devices (Patent LR 3-1(b))	Location of Each Limitation (Patent LR 3-1(c))
	portion of the image processing system, wherein the attitude identifies information that enhances real scene image information at the device;		
b.	a graphic processor for processing and combining the information that enhances real scene image information with the real scene image information to produce an augmented real scene image for viewing; and	Please see claim 1 of the '138, '536 and '936 Patents above.	See claim 1.
c.	a display showing the augmented real scene image that is produced in visual proximity of the attitude device.	Please see claim 1 of the '138, '536 and '936 Patents above.	See claims 1 and 8.

Claim No.	Language of Claim	Samsung Infringing Devices (Patent LR 3-1(b))	Location of Each Limitation (Patent LR 3-1(c))
12.	The system of claim 11, wherein the attitude device includes a magnetometer.	Please see claim 1 of the '138, '536 and '936 Patents above.	See claim 8.
13.	The system of claim 11 further comprising a database for storing the information that enhances real scene image information.	Please see claim 1 of the '138, '536 and '936 Patents above.	See claim 1 and 6.
14.	The system of claim 13 wherein the information stored in the database is identified by attitude.	Please see claim 1 of the '138, '536 and '936 Patents above.	See claims 1 and 6.
15.	The system of claim 11 further comprising a real time position device for identifying a geographical position of said portion of the image processing system.	Please see claim 1 of the '138, '536 and '936 Patents above.	See claim 1.

Claim No.	Language of Claim	Samsung Infringing Devices (Patent LR 3-1(b))	Location of Each Limitation (Patent LR 3-1(c))
16.	The system of claim 15 further comprising a database for storing information that enhances real scene image information.	Please see claim 1 of the '138, '536 and '936 Patents above.	See claim 6.
17.	The system of claim 16 wherein the information stored in the database is identified by geographical position and attitude.	Please see claim 1 of the '138, '536 and '936 Patents above.	See claim 6.
18.	An image processing system comprising:	Please see claim 1 of the '138, '536 and '936 Patents above.	See claim 1.
a.	a real time position device identifying a geographical position of at least a portion of the image processing system, wherein the geographical position identifies information that	Please see claim 1 of the '138, '536 and '936 Patents above.	See claim 1.

Claim No.	Language of Claim	Samsung Infringing Devices (Patent LR 3-1(b))	Location of Each Limitation (Patent LR 3-1(c))
	enhances real scene image information at the geographical position;		
b.	an attitude device identifying an attitude of at least a portion of the image processing system, wherein the attitude identifies information that enhances real scene image information at the device;	Please see claim 1 of the '138, '536 and '936 Patents above.	See claims 8 and 11.
c.	a database for storing information identified by geographical position and attitude that enhances real scene information at the geographical position;	Please see claim 1 of the '138, '536 and '936 Patents above.	See claim 6.
d.	a graphic processor for processing and combining the information	Please see claim 1 of the '138, '536 and '936 Patents above.	See claim 1.

Claim No.	Language of Claim	Samsung Infringing Devices (Patent LR 3-1(b))	Location of Each Limitation (Patent LR 3-1(c))
	retrieved from the database that enhances the real scene image information with the real scene image information to produce an augmented real scene image for viewing; and		
e.	a display for showing the augmented real scene image that is produced in visual proximity of the geographical position identified by the real time position device.	Please see claim 1 of the '138, '536 and '936 Patents above.	See claim 1.

EXHIBIT B

EXHIBIT B

Augmented Reality applications include:

Google – Google Goggles, Google Sky Map
SK Telecom- Ovjet
Chemical Wedding - Cyclopedia
Intelligent Spatial Technologies – Pointer Software
GasBuddy.com – Cheap Gas!
Multiplied Media Corporation – Poynt
Canpages – Canada Eye
ZipRealty – ZipRealty Phone app
Craic Design – Pocket Universe: Virtual Sky Astronomy
Vito Technologies – Star Walk – 5 Stars Astronomy Guide
Ajnaware Pty Ltd – Sun Seeker: 3D Augmented Reality Viewer
Niftybrick Software LLC – Heads Up Navigator
Intridea Inc. – Car Finder
DP Technologies Ltd. – Dish Pointer Augmented Reality
Jonathan Harclerode – Peaks
Adam Eisenman – Satellite Augmented Reality
Philip Endecott – Panoramascope
John Hannon – Twittality
New Reality LLC – Argo
Syncreticworks – Odiyar
Navimatics Corporation – Reality 2.0
Touchinside - MetroAR
Buuuk Private Limited – BuUuK
Rolf Assfalg – WorldViewer
Mark Kaminisky – Augmented Reality
RTP LLC – REALSKI
Mopimp Prouctions – BumpRADAR
Roundhouse Technologies – SpotCrime
Salzburg Research – Peak.ar
Chris Hughes – CAR Locator
Geometry Pty Ltd. – Look Around
M2Mobi – Nulaz AR Premium version
King-On Yeung – GeoGeo
A2rt – Augmentizer
Shu Ning Bian – GeoNote
Nuthon IT Solutions Ltd. – Leisure Guide

Gambero Rosso - Ristoranti d'Italia del Gambero Rosso 2010
Jason & Elsa Inc. – Taiwan Food AR, Beijing Dicovery AR
ETH Zurich – SwissPeaks, WorldPeaks
OSnapplications LLC – UTourX
PhoneSoftware – Metro Madrid AR
Dove Valley Apps – Lodestone AR Compass, hideNtweet
Burning Frog – GEOChaser
Sengaro GmbH – mobeedo
Ibrahim Kocaalioglu – A Nearby View
Eniro Norge AS – GuleSider Live
AR Games LLP – Car Finder
WhereMark LLC – WhereMark
Newton Inc. – Nearby Navigator
Intelligent Gadgets – AR Viewer
Discover Anywhere, Inc. – DA Transit
Michael Zoellner – TwittARound
CHYP Co. – HiPage go!
Leumi – Cleumi
Hogere – Transparent Earth
Danil Glinenko – WikiEye
Mike Krieger – CrimeDeskSF
eTag Media (Shanghai) – XINGWIKI(AR)
KOP Software Solutions Co. – BUL
Liapis Constantinos – World Tags
Eniro Sverige AB – på sjön
Mobikats Ltd. – My Augment Reality, Where's the Tube?, Where's the Subway?
Nyros Technologies – Kakindada Augmented Reality
Yellowbook – US Yellow Pages Search
Augmented Views – Augmented Views
Joa – AugmentThis!
DeadlyAndroid – WayFinder NYC, WayFinder Vancouver
Hector Judez – Where is my car? AR
SpecTrekking.com – SpecTrek Full
Andrej Solar – TweetAR
Cassandra-Apps – Geo-Notes
Christoph Mayer - SomaView
MoVue Mobile – Movue
Beepoint – Weegoh
Terminal Eleven LLC – Celeste

Kenbore Lab – Kan-Ban World
Phyora – AugSatNav
SuperMedia LLC – Superpages
FSARDevDep – TravelCamerAR
Damnsoftware – Damn Golf!
UDR Webmaster – UDR Apts AR
Torben Schinke – SINLA – the AR guide
Caltrain – Wantoto Lite
Masternaut Three X - Masternaut Augmented Reality
Tripwolf – Tripwolf App
Yell.com – Yell Labs
Fraunhofer - Augmented Reality about Roman Forum and Satricum
Sequence Point Software - ARound project (Symbian OS)
Kooaba – ETH Augmented Reality Prototype
GraffitiGeo - Graffitigeo augmented reality
TagWhat – TagWhat Social Augmented Reality
Molchan Marine Sciences – ARVCOP marine navigation AR system
Heckacopter – Glow
Todd Hopkinson – Magnificent Library
Paully A. Ahafonau – Spyglass
SIMBIOTICS LIMITED – Sky Siege
Escapist Games Limited – Star Chart
Hunter Research & Technology – Theodolite
MGM Grand - VEGAS REALITY
mTrip - mTrip - Travel Guides for Android

EXHIBIT C

Integration of GeoVector technology into handset

- Best approach is to:
  - Include integration as part of the overall design of a new handset
  - Use a heading sensor subsystem
  - Integrate to the Microcontroller bus or serial port

- Start as soon as possible to ensure:
  - Placement of heading sensor is optimal to give distance and or shielding from magnetic components and interference
  - Adequate bus and processor cycles are available to sensor subsystem
  - Adequate memory available to application
  - System design for handset includes heading sensor subsystem (and evolution of the subsystem) in overall design trade-off decisions

Samsung SPH-i330

- Palm OS
- CDMA2000 1xRTT
- 66 MHz Motorola Dragonball processor
- 16 MB RAM
- 8-bit TFT color display with a resolution of 160 x 240 pixels
- 5.82 ounces (165 g)
- 4.92" x 2.36" x 0.71" (12.5 x 6.5 x 1.8 cm)

- Which CDMA Chip-set?
- GPS mode(s) enabled?
- Heading sensor:
  - Integrate?
  - Bulge-out back cover?
  - Plug on?

Recommendation:

- **Start work ASAP to integrate GeoVector technology into Samsung products:**
  - Samsung SPH-i330 and Palm based follow on
  - Samsung MIT (Mobile Internet Terminal by Samsung based on Microsoft's Pocket PC platform)
  - SmartPhone 2002 based products
  - Future products

GeoVector Corporation **Proposal to Samsung**

GeoVector Direct
Non-Telco GeoVector Enabled Hand-Held Devices

Proposed Scope:

1. Samsung will receive a world-wide, non-exclusive, perpetual (subject to the retention terms of paragraph 5 below) license (the License) to produce and sell all GeoVector enabled devices other than those that connect to GeoVector servers via Telco (GV Direct devices). i.e. the License will be for all GV devices that connect to the web without going through a Telco.
2. Samsung will be GeoVector's world-wide preferred partner for GV Direct devices
3. Samsung will pay GeoVector an up front license fee of $5 million (US$)
4. For years 2 and 3 of the License Samsung guarantees a minimum GV Direct device royalty revenue to GeoVector of $500,000 a quarter.
5. To the retain the License after year 3 Samsung will yearly, before the onset of the final quarter of the current license year, guarantee a minimum GV Direct device royalty revenue to GeoVector of $750,000 a quarter. If Samsung fails to commit to this guarantee before the onset of the final quarter of the license year then the License will terminate as of the end of the current license year.
6. Samsung will pay GeoVector a royalty of 5% of the value of any GV Direct devices sold.

Operational modes for GV Direct devices and revenue model for each:

1. GViD search carried out on server:
    a. Device sends GViD search parameters to server and receives results. Device must be in monthly subscription status for each application for which a GViD search is requested. (See below for subscription use fee split.)

2. GViD search carried out in device (GViD Koala):
    a. Device aggregates internal Geodescriptor database. The internal Geodescriptor database is updated by either:
        i) Device being in monthly subscription status for each application for which an update is requested (See below for subscription use fee split). The update may be done automatically by either the device or the server, and/or
        ii) User requests an update of an existing database or uploads a new database for a one-time use fee (See below for use fee split).

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Proposed Use fee split:

1. GeoVector receives use fees (one-time and subscription) from users of Samsung produced GV Direct devices and splits the fees as follows:
    a. Application Provider 60%
    b. Samsung 10%
    c. GeoVector 30%

3rd party databases and software:

1. 3rd party database and software suppliers would be required to purchase a key kernel, from GeoVector for the database or software to be compatible with a registered GV Direct device. Fees and arrangements to be determined.

GV Direct Concept Images

See Olympic heroes of past games compete against the athletes of today with immersive Augmented Reality (GeoVector Sentinel) technology that allows 3D graphics to be combined with spectators view of the real world. These graphics could be run in conjunction with real races and events or viewed at will while spectators were waiting for races and events to take place.

Users of GeoVector enabled devices would point at tourist sights and be shown historic or current views and images of the point of interest. They could also be given audio (music and/or narration) and video files to view or listen to that were relevant to the chosen view. The device in effect becomes a multimedia guidebook that opens to the correct page simply through pointing at objects in the real world.

While at sporting events users could point their GeoVector device at different areas of the arena and be given information about events that had taken place in that area. In this instance a crash animation is offered to the user. The animation could also be made to coincide with the user's real view of the track.

Old photos of an area could be shown to the user as windows into the past. Note that these images could also be users own family photos that would be geo-tagged. User could have a Geo-Photo album that could viewed as they travel the globe. The photos of your family in San Francisco from your visit in 2006 would be there for you and all of your relatives to view, placed into the real world view, when they returned in later years.

Your GeoVector enabled Samsung camera can keep track of what you have and have not taken photographs of, thereby ensuring that you see all the sights you want to see and get images of them while you are on vacation. Combine this with the multimedia pointing enabled tour guide and you have a very powerful device.

The camera can also guide you to desired destinations.

The camera can also suggest the best time of day, and even the best position and angle to take photographs from.

Samsung Business Proposal

GeoVector is pleased to propose a business partnership with Samsung to develop and deploy device and services which support pointing interfaces to location information in the North America and worldwide.

GeoVector Overview

GeoVector® Corporation, is the provider of the "advanced pointing search" capability for location applications.

GeoVector's pointing search method is a dynamic step forward in ease of use and greatly improves access to a wide variety of location aware applications. Pointing is a natural gesture that signals a request for information about a particular object or place and cuts down on unwanted information.

The system is highly desirable in location marketing environments where users can point their phones at retail establishments in order to learn about special offers. In this way, marketers can be in real-time communication with each potential customer and can make offers exactly when the customer is ready to buy.

A US company Headquartered in San Francisco, CA, GeoVector develops solutions for the efficient delivery of location-based services. Supported by significant intellectual property, GeoVector's spatial search engine technology provides the foundation for new community, gaming, advertising and other location sensitive applications. GeoVector allows mobile web services to be attached to any object or location and launched just by pointing with a mobile device.

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A Natural Interface

GeoVector brings to the mobile market simple and efficient delivery of location application services. Point the phone to indicate interest in a building, an object or a direction. This one-handed gesture signals a request for information about a particular thing and is a natural and intuitive way to refine a location search.

GeoVector uses the knowledge of a phone's position (through GPS) and direction (using an electronic heading sensor) to allow users to point their phones at objects they are interested in to gain information about them.

GeoVector's pointing system greatly improves access to a wide variety of location aware applications: consumer and enterprise.

- Point to place a phone call
- Point to find out when the museum opens
- Point to find an ATM on the way home
- Point to launch a virtual tour of a home for sale
- Point to leave post-it messages or to retrieve them
- Point to ask for a coupon; see a movie trailer; download a song
- Point to find a safe direction away from a dangerous situation
- Point to locate an enemy, a clue or an ally in a location based game
- Point to automatically label a picture

Technical Background

GeoVector uses the device's position and direction to create a virtual arrow which intersects with objects in a GIS based database. GeoVector software, referred to as GViD®, identifies the object which the user has targeted. After the object has been identified, the user will be presented with a number of channels, also managed within the GeoVector environment, that allow the user to specify what type of information he would like about his targeted object; for example, hours of operation, historical information, marketing offers, etc. The data offered through these channels can be provided by existing or new location application providers.

To implement pointing search, the mobile device must have sensors which determine its position (GPS) and the direction in which it is being pointed (electronic compass). Many handsets incorporate GPS. Electronic heading sensors are being integrated as the next step in refining pedestrian navigation and location based services.

Pointing brings significant efficiency and user control to the location search environment.

Search Using GPS Alone

GeoVector Pointing Search

GeoVector's pointing search system can be implemented on the client or the server and can be delivered in any network frequency or operating environment: BREW, Java, Windows Mobile, Symbian Android, etc.

Please see Appendix A for a detailed description of the architecture of the GeoVector location based information access system.

Intellectual Property Assets

GeoVector Corporation has been building an intellectual property portfolio for more than 10 years and consequently has a large library of patents that provide a significant barrier to entry for competitors who may be trying to develop any form of similar pointing based search engine or business.

GeoVector has over 70 patents issued or pending, both in the US and internationally. While breadth of the IP portfolio is too deep to summarize completely, there are three main areas that are well covered:

- Using a mobile device to point and receive information (What is that? or How do I get to?)
- Adding virtual graphics to real world views, based on location and direction (labeling a picture, graphic overlay, etc. using imagery that is aligned with the real world)
- Responding to sensed conditions (movement) of a mobile device (power management, reduction of user perceived latency, etc.)

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Competitive Methods

Several methods have been recently explored to refine the delivery of location based information.

Image Matching
This method uses the in-phone camera to take a picture that is passed to a server equipped with images of various points of interest. An attempt is made to identify the targeted image by matching it with a stored image.
Microsoft labs and several others included A9 from Amazon, have attempted this method but were faced with a large number of obstacles including: creating and maintaining a massive image data base; allowing for off centre shots; overcoming interference such as physical obstacles obstructing picture, poor lighting, inclement weather, etc. Furthermore, many structures such as utility pylons are identical giving multiple possible locations for each query.

RF-ID
These devices are used as local beacons bearing information about the building or object. They can be used successfully when the user is in very close proximity such as at point of sale or in an art gallery. The disadvantage of this method is that transmitters must be affixed to the object and they have very limited range.

Using GPS Alone
Using GPS to determine the position of the user narrows a search but still results in a very large number of points of interest around the user. A much more refined search is necessary to satisfy the user quickly and efficiently.

QR Codes
QR codes require that the object be marked. While QR codes are satisfactory for retrieving web addresses from print media, they would need to be very large to be readable from a distance if attached to buildings, bridges and historic structures. A large enough QR code when used on a street bill-board would waste very valuable real-estate.

Accessing information by pointing is simple and efficient for the user and easy to maintain for the data provider. The ease of creating and maintaining the underlying data bases based on standard web solutions for advertisers provides a compelling solution for merchants and others wishing to reach the mobile user.

What GeoVector Brings to Samsung

Geospatial Search Technology
GeoVector has been successful in developing products which rapidly search geo-spatial data bases. The GViD™ search technology deployed in Japan is the result of many years of experiments and several pre-production versions in a variety of programming languages and with widely varying data-base structures. GeoVector's geo-spatial search technology is optimized for rapidly ordering the data by both position and direction of search indicated by the user and is structured to

accommodate a wide variety of search parameters. For example a simple search request defines the position and direction plus the cone of search (i.e. 5°, 30° etc) along with the selected categories (i.e. accommodation, restaurants, banks etc) to be retrieved and displayed to the user.

More complex searches can be deployed with the cone of search being a three dimensional cone that essentially mimics the conical field of view of a camera lens. Similarly the object search can be defined with the added complexity of size and shape including height as well as many sub-parameters such as type of food, class of accommodation and etc.

This search technology can be deployed either in a server to thin client configuration or in a solely thick client configuration (i.e. entirely self contained in the mobile device) or in hybrids that exploit the increasing processing and storage available in smart client (handset) devices where part of the search refinement is performed in the handset. The company is working on several improvements such as the ability to rapidly handle full three dimensional objects and the ability to handle rapidly moving objects (i.e. vehicles in motion, individuals in a sporting event or game and etc.)

User Interface and Application Technology

GeoVector has been successful in developing means for presenting meaningful, simple to use and engaging pointing based applications to its users. This work takes place in several ways:

- Advanced Concept Development ("ACD") where future needs are researched, story boards created and in some cases application prototypes built and field tested. The company's ACD work enables novel applications and techniques to be probed and refined.
- Product Concept Development ("PCD") involves the creation and refinement of the interface and requirements for a specific application to meet a defined and researched market opportunity. This work typically takes place in close cooperation with our partners. For example, our PCD team worked closely with both Mapion and Quattro Media in designing and specifying "Mapion Pointing Appli Powered by GeoVector" PCD remain engaged with the product in all phases and work closely with our partners to prepare product advancement plans.
- Mobile Device Product Development most typically results in prototype versions developed within GeoVector followed by engaging our contract product development partners for production.

Tool Set Development and Support

GeoVector develops its products and services with a view to facilitating sub-contracting and to licensing for development by third parties. Client side software can be made available as source-code for tools and, in selected instances, complete reference applications. In this way the sections of code handling AGPS and the Compass along with the special screens required by the carrier can be readily modified or adopted by the third party.

GeoVector will also make available an SDK available to location application developers who which to implement support for pointing interface features.

Sensor and Mobile Device Technology

GeoVector has substantial experience in methods and means for exploiting a variety of sensors in mobile platforms. These sensors include but are not limited to:

- Positioning technologies such as GPS, Aided GPS, cell-site ID and other core infrastructure methods as well as user plane positioning methods.
- Heading sensors of many forms that typically measure the earth's magnetic field.
- Attitude and motion sensors including miniature rate-gyros and accelerometers.

GeoVector has practical experience in applying advanced commercially available sensors in mobile platforms and has built and fielded a number of prototypes that probe and verify both core technology and provide client systems for customer centered trials of the software and applications in preparation for rendering these to fielded products.

GeoVector technical staff remains very active in assessing new sensors and sensor technologies and is assisted both by its partners and by a set of key consultants and contractors. The Company has novel and patented technologies that exploit the fusion of sensors in mobile systems. For example, the company has considerable knowledge on how to use sensors to reduce the power consumption and latency of mobile devices.

Areas of Potential Business Cooperation

Launching Commercial Pointing Phones and Applications

GeoVector would be please to work with Samsung to deploy pointing devices and services in North America and world-wide. GeoVector can provide design assistance for the integration of the heading sensor if necessary and can provide the client and server software necessary to implement pointing driven searches. GeoVector will work with Samsung to support special implementation requirements of Samsung's carrier partners and to support pointing implementation within existing and future location based applications. In addition, GeoVector will work with Samsung to assure that sufficient, location data and applications are available to assure commercial success.

Delivering User-Requested Location Advertising

GeoVector will support pointing access and delivery of location advertising either by providing Samsung and its partners with an ad server and service or by integrating pointing into ad server systems developed or selected by Samsung.

Adding Pointing and Automatic Picture Labeling to Cameras

GeoVector will assist Samsung with the implementation of an automatic picture labeling feature which is driven by pointing. This implementation can be staged becoming more sophisticated as technology and phone features advance.

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Off Network Devices
GeoVector has developed a concept design for a device in which data is self contained and search activities take place in the client. This device is location based but carrier independent. Data can be updated or refreshed through a WiFi connection. The device is targeted at frequent travelers and tourist but could be adapted for any number of commercial or enterprise applications. Please see Appendix B for more detail on this device.

Pointing and Power Saving Integrated into Mobile Devices
GeoVector will provide Samsung with a system which uses the 3 axis accelerometer associated with the 6 axis compass to implement support for user gesturing to control applications; to anticipate user needs thereby reducing latency and to make more efficient use of system resources to reduce power consumption.

Implementing Augmented Reality
Support for augmented reality in mobile devices is expected to be offered in stages as it is dependent on image processing capabilities not yet available on mobile devices. Image annotation and registering digital on images is a specialization area for GeoVector. GeoVector would be happy to assist Samsung with the design and implementation of location sensitive augmented reality features in their handsets, cameras and other mobile devices.

Sensor Utilization
GeoVector has a great deal of internal knowledge of and experience with sensors. GeoVector would be happy to work co-operatively with Samsung to take advantage of sensors to bring enhanced features to their product lines.

Potential Business Arrangements

While GeoVector believes that is it premature to determine in specific detail the structure of business terms, it is appropriate to outline methods in which our companies could successfully work together.

GeoVector has the highest respect for Samsung as a leading electronic technology provider and a very successful provider of consumer products. GeoVector recognizes that our company has a great deal to gain by partnering with Samsung to bring pointing products to consumers. We believe that GeoVector's technology, sensor expertise and location service experience adds value and complements Samsung's location aware features and applications and that together we can bring to market very compelling and successful products.

GeoVector will work with Samsung to determine the win-win business arrangement that is most appropriate for the targeted product, application or service. As a high level concept, GeoVector will grant Samsung the right to implement and offer pointing based devices, applications and services. Basic location search activities will require no fee. GeoVector will request a percentage of revenue from any application or service which is fee based or advertising supported.

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Our business model dictates that general pointing searches for basic information which a user might ordinarily find in a phone book should be provided to the user without fees. Premium applications whether consumer or enterprise (applications for which the user must pay a fee or which are provided by sponsorship or sustained by advertising) will be licensed on a revenue sharing basis.

GeoVector will be happy to discuss business terms which Samsung suggests and we are confident that we will be able to agree to terms which are mutually satisfactory.

Summary

GeoVector appreciates the time you have taken to review our proposal. We believe that Samsung is the ideal partner to introduce pointing location based services to the world.

Please contact us if you require clarification or more detail on any of the subjects presented here.

We are excited about the opportunities of a Samsung–GeoVector partnership and we look forward to our next steps together.

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Appendix A

GeoVector Technology Overview

GeoVector has been developing the complete end to end solution, both the client and server components, as well as a variety of tools to support the mobile client operating environments.

GeoVector has launched this technology commercially in Japan with two BREW applications released on the KDDI Network in conjunction with our content partner, Mapion.

Apart from the BREW client, prototype applications have been developed for Windows Mobile and a range of tools for J2ME, Flash, XML, Nokia's Series 60 environments.

Tools for the Google Android environment are in development.

Server solutions have been built for Microsoft .NET and Linux. Microsoft SQL Server 2008 is under evaluation.

Client Solution Overview

GeoVector's current commercial applications have been built in the Qualcomm BREW environment. This environment was chosen because it is the operating system on the KDDI handsets that have been launched in Japan which include the necessary hardware (GPS/Compass) to support our technologies.

Two commercial applications have been developed. Mapion Local Search v1.0 was developed in BREW 1.0 and was launched in 2006. This was a pilot application and was released on three models of mobile phones. The server solution used with MLS1.0 was developed in .NET.

Our second application, Mapion Pointing Appli v2.0 was launched in 2007, this was developed for the handsets that supported BREW 2.0 and new features were able to be included in this solution. This application supports a broader range of handsets and the server solution is a Linux implementation.

Non-commercial applications have also been developed for carrier evaluation. Many mobile operating systems have been developed, however our current focus is on Windows Mobile v6.0. Four applications have been developed and trialed to date, a carrier specific Local Search solution in Europe, a GeoVector Local Search application for a carrier in USA, a Windows Live pointing application for Microsoft and a BlackJack version of Windows Live for Samsung.

The Windows Mobile solution runs on a standard Windows Mobile Device communicating via Bluetooth with an external GPS and Compass unit. The two

carrier solutions talk directly to GeoVector's Linux servers in New Zealand, the Windows Live solution talks directly to the Microsoft Live servers. We are currently developing a solution that uses the internal GPS of some Windows Mobile devices, still with the external compass unit.

Additional tools have also been developed for Java, Flash and XML.

With the imminent launch of the Nokia 6210 Navigator, tools are being developed for the Series 60 environment. Also the hardware spec for Google's Android phones includes the necessary hardware for our technology and Android tools are being developed.

Server Solution Overview
GeoVector has developed multiple server solutions.

GeoVector's server solutions have the product name, GVID, GeoVector Information Descriptor. GVID stores an index of the GIS database and performs the spatial search to determine which objects are in the customers' preferred direction.

The Microsoft .NET GVID server solution was our first solution and launched in Japan for development in 2005, commercial services followed in 2006. This server is still being utilized for Mapion Local Search 1.0.

The Japanese carrier had a preference for a Linux based solution, GVID 2.0 was developed and deployed in 2007. Our latest commercial application in Japan leverages this server.

We have also developed the server tools in the handset (GVID Micro Server) and our Microsoft Live application is using this technology.

There is also an ability to add a POI database to the Micro Server which allows for searches to be performed while offline. Syncing of this database and access to online Rich Content can be controlled by the application (e.g. only sync when in WiFi).

With the launch of SQL Server 2008 and its embedded spatial tools, we are evaluating this as a more efficient environment for GVID 3.0.

Variables
The GVID Client/Server solutions have a large set of variables available to them, the mandatory (M) and frequently used optional (O) variables are listed below.

http://jp.gvid.info/locate.php?lat=6659406&lon=26044874&head=50&spread=60&range=300&mobileid=0000&chid=2&deviceid=XXXX&offset=10&page=2

lat	Latitude of Device (raw degrees)	6659406	M
lon	Longitude of Device (raw degrees)	26044874	M
head	The direction of Search (0-359 degrees)	50	M
spread	The span of the Search (1-360 degrees)	60	M
range	The distance to search (meters)	300	M
mobileid	The unique ID of the handset	0000	M
chid	The application specific ID (numeric)	2	M
deviceid	The unique ID of the type of handset	XXXX	M
offset	The number of results returned per page of results (numeric)	10	O
page	The page of results to display - must have offset to work (numeric)	2	O
ext01-05	The application specific search filters (numeric)	in development	O

Additional variables including keyword search and access to multiple POI Content Providers are used in the latest GVLS build.

3D Search

Beyond the variables mentioned above, 3D searching requires the POI to contain altitude information as well as the search vector using the handsets altitude, pitch and roll variables in performing a 3D search. We have already started working on the algorithms for these types of search.

GVID.NET Data Traffic

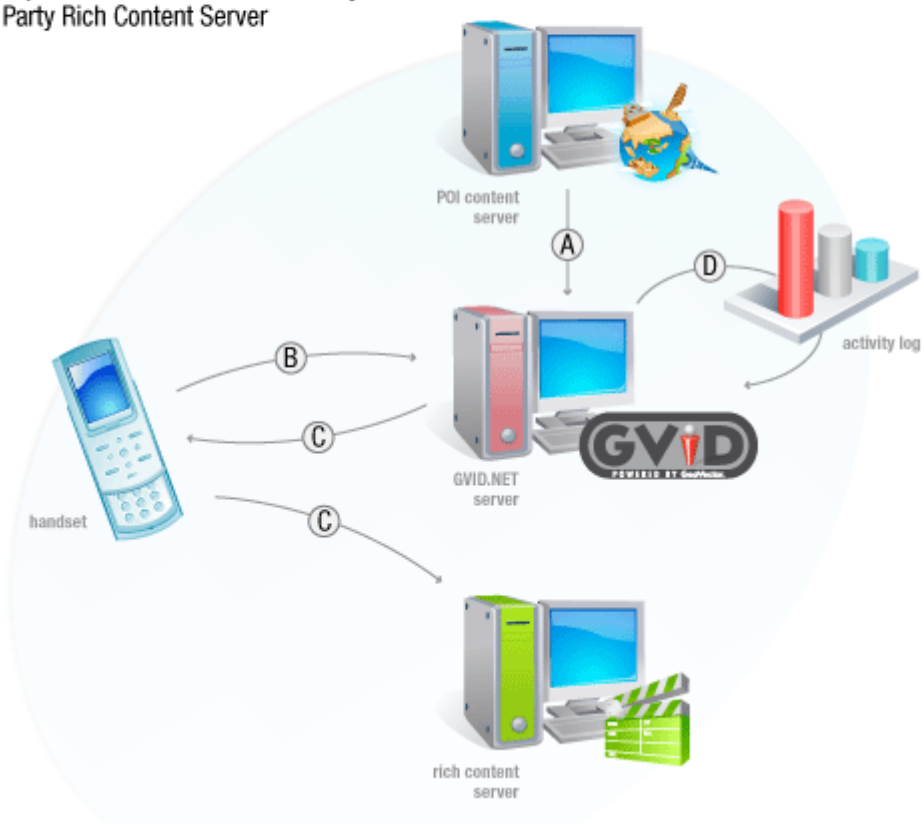
Ⓐ GVID.NET indexes 3rd Party POI Content Server

Ⓑ Handset requests search to GVID.NET

Ⓒ GVID.NET performs directional based spatial search and returns results to handset

Ⓓ GVID.NET logs search activity

Ⓔ Handset requests additional content directly from 3rd Party Rich Content Server



GVID Linux Data Traffic

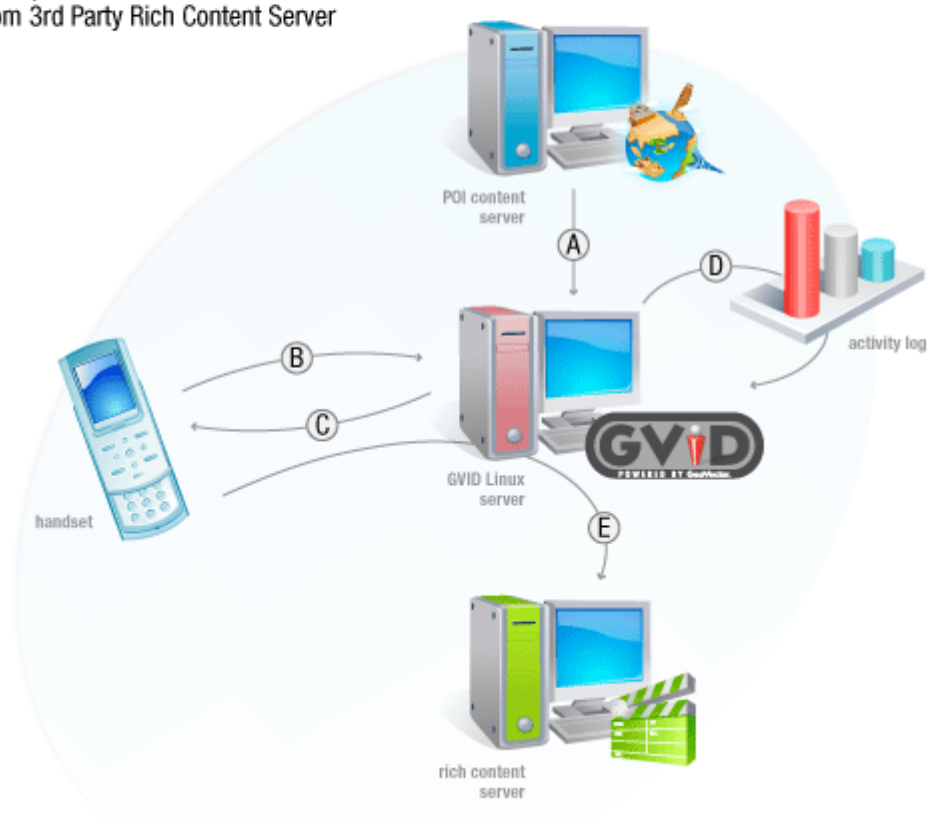
Ⓐ GVID Linux indexes 3rd Party POI Content Server

Ⓑ Handset requests search to GVID Linux

Ⓒ GVID Linux performs directional based spatial search and returns results to handset

Ⓓ GVID Linux logs all server activity

Ⓔ Handset requests additional content via GVID Linux from 3rd Party Rich Content Server



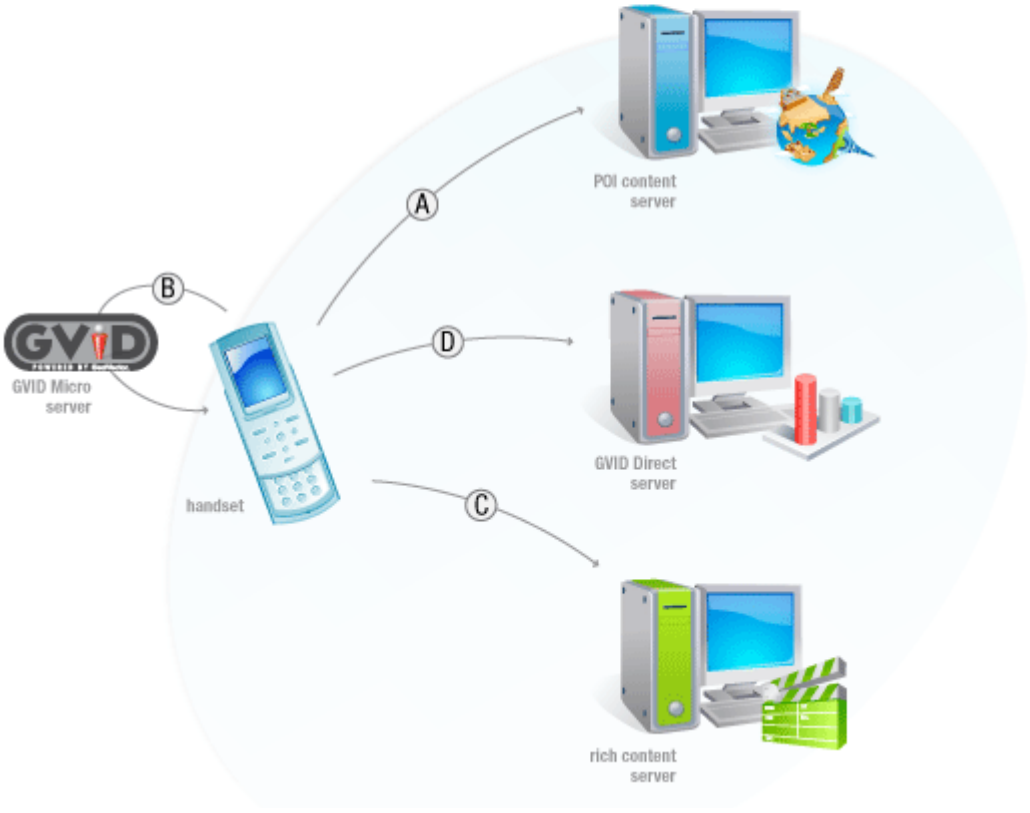
GVID Direct Data Traffic

Ⓐ Handset requests search to 3rd Party POI Content Server

Ⓑ Handset performs directional based spatial search via internal GVID Micro Server

Ⓒ Handset requests additional content from 3rd Party Rich Content Server

Ⓓ GVID Direct logs all handset activity (search requests, object queries, phone, map & rich content)



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GVID Offline Data Traffic

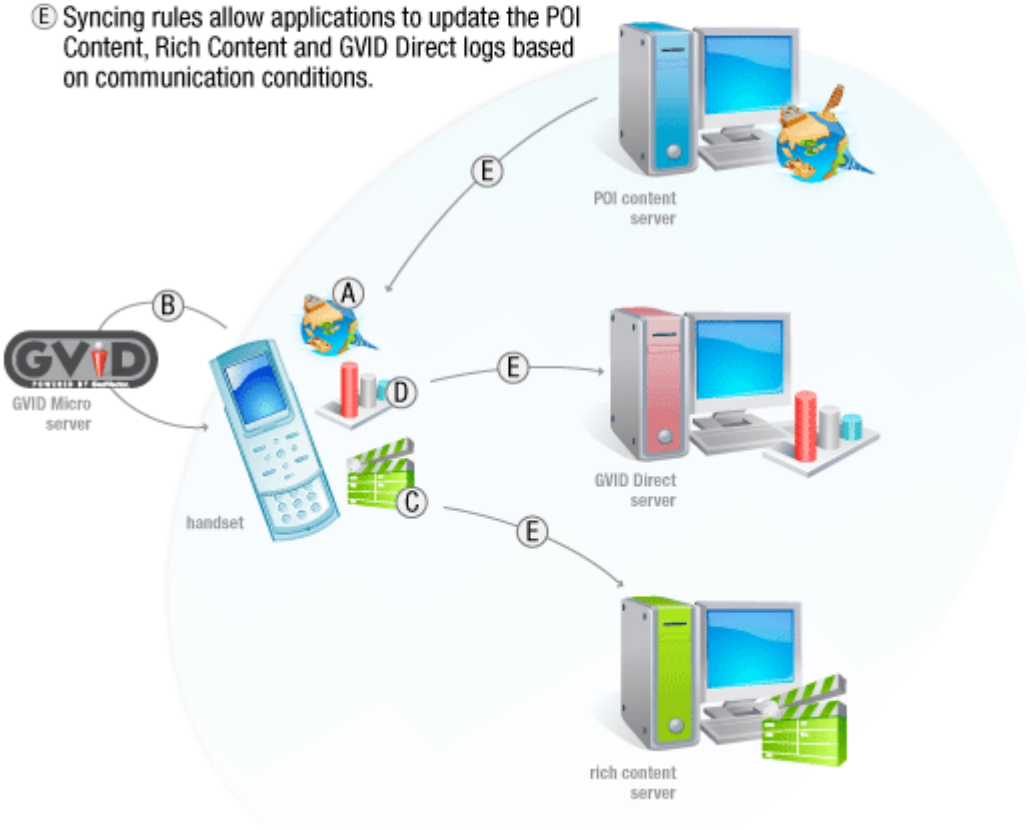
Ⓐ Handset stores 3rd Party POI Content

Ⓑ Handset performs directional based spatial search via internal GVID Micro Server

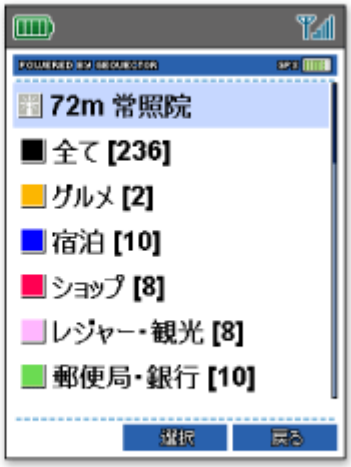
Ⓒ Handset can optionally store additional content from 3rd Party Rich Content Server

Ⓓ GVID Micro Server logs all handset activity.

Ⓔ Syncing rules allow applications to update the POI Content, Rich Content and GVID Direct logs based on communication conditions.



Search



Category Results

Results

Object Detail

Mapion Local Search
Commercially deployed in 2005 on the KDDI network in Japan.
Mapion Local Search references around 700,000 POI within Japan.
Communicates with the GVID .NET server and offers rich content for all Mapion POI.

Splash

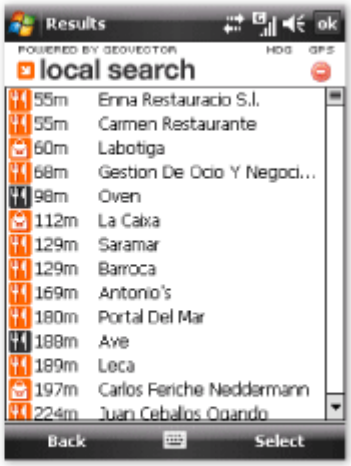
Category Results

Results

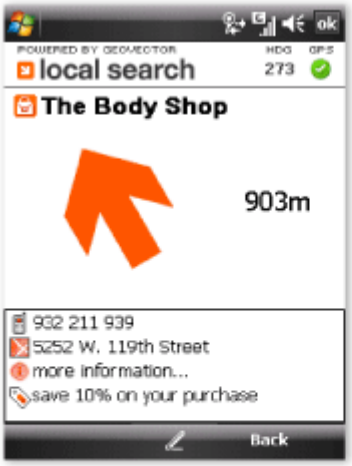
Object Detail

Mapion Pointing Appli
Commercially deployed in 2007 on the KDDI network in Japan.
Mapion Pointing Appli references over 750,000 POI within Japan.
Communicates with the GVID Linux server and offers rich content for all Mapion POI.

Splash



Results



Object Detail

Coupon

Orange Local Search

Prototype for internal assessment within Orange

Orange Local Search references around 1,000 POI around their test labs.

Communicates with the GVID Linux server and offers coupons & rich content from GeoVector.

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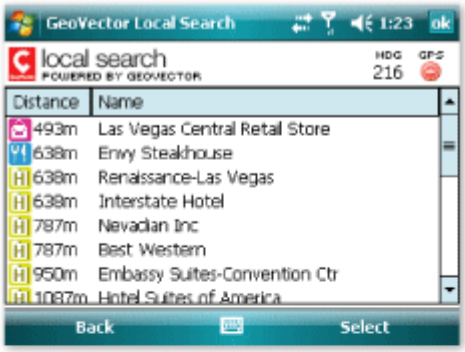
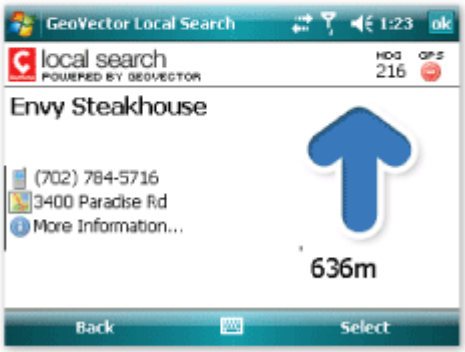
Splash



Results



Object Detail

Rich Content

GeoVector Local Search
Prototype for third party assessment of Pointing.
GeoVector Local Search references all Microsoft's local.live.com data worldwide. Communicates with local.live.com via GVID micro server and offers rich content from live.com.

Appendix B

WorldSurfer Design

Introducing: The WorldSurfer

GeoVector Corporation has technology and extensive intellectual property covering the domain of using the knowledge of position and direction to identify an object. This allows mobile device users to request information about any object in the real world by using a simple gesture – by pointing at it.

This provides an opportunity for international travelers to carry a single device that allows them to easily Surf the Whole Wide World ™, GeoVector has called this device the WorldSurfer

GeoVector is now seeking partners and investors who are interesting in developing and marketing a converged device with the WorldSurfer capabilities.

Summary of Device Capabilities

The WorldSurfer is designed to be a truly carrier independent, international information and communication device. This is the only device the traveler needs to have a secure, rich and entertaining experience. Their WorldSurfer will guide the traveler to places of interest and provide full guidebook quality information about all areas and points of interest. The Surfer can support text, audio programs and videos. It provides access to dining guides, reviews and reservation systems. The user needs only to point the Surfer at a place of interest to trigger the search for data about it.

More than an electronic guide book, the WorldSurfer is a full featured, keepsake quality camera that will append POI information to pictures as are they are taken

allowing users to return home with a completely annotated digital photo album. Aiming the camera at the subject allows GeoVector's system to indentify it and the photographer is then given the option of storing information about each of the photographed subjects including the exact time, the location of the camera and direction in which the camera was pointing for the shot.

When users need to phone home; change travel plans, or pick up email; they just take their World Surfer to the closest public Wi-Fi or Wi-Max area and they will be live on the Internet and can make VOIP calls. This completely frees the frequent traveler of the requirement to make a costly long term commitment to one particular carrier.

When it's time to "phone home", the WorldSurfer will guide users to the nearest public Wi-Fi/WiMax site. No need to read maps or figure out exact location – they just follow the interactive arrow until they arrive at the hot spot.

WorldSurfer a Enhances a User's View of Events seen through the Camera by Overlaying Relevant Graphical Information on to their Real World View

Device Details

Proposed Hardware Specifications

- High Megapixel Digital Camera
- GPS Receiver with SUPL Aiding
- Full 6D Sensor Package – 3 Axis Compass and 3 axis Accelerometers
- Wi-Fi and WiMax
- Large Native Storage Capability
- Removable Storage Capability
- High Resolution Screen – Possibly Touch Screen
- High Performance Mobile Chip-Set with Power Management
- QWERTY Keyboard
- Long Life Replaceable Battery
- SIM Slot & Unlocked GSM or WCDMA phone – Optional\

Proposed Software

- Operating System: To be chosen in consultation with partners
- GeoVector's client resident object identification system, Micro Server GViD™
- GeoVector's Advanced Search Channel Media Service
- VOIP phone / Skype – World phone within Wi-Fi/WiMax range
- Photographer Tips and Guide
- Auto upload to Flickr (or similar)
- Tour Guide and Concierge – Find shops, restaurants & city sights
- Historic Guide – Immerse yourself in the local history
- Translation Tool and Guide to Local Customs
- Interactive Mobile Location Based Games
- Replace Maps with Guidance to Destinations
- Public Transportation Information
- Web Browser
- POP Email client
- MP3 / Digital Media Player

Device Support

Device support would be based on the existing model for personal computers. The manufacturer of the WorldSurfer would be responsible for support of the hardware itself. Suppliers of the software and applications on the device would be responsible for the support of their applications. The provider of the POI data would be responsible for the upkeep and accuracy of that data. GeoVector would

be responsible for the GViD object identification accuracy and location driven access to supporting media or application channels.

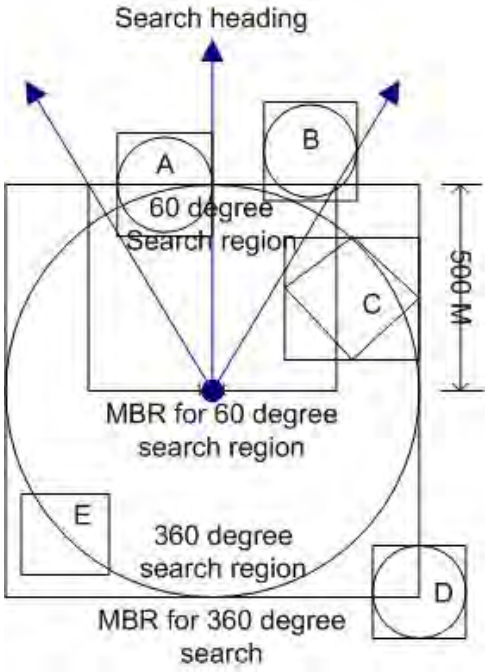
Understanding GeoVector's Pointing

The GeoVector pointing system requires a device to be able to determine location (GPS) and direction (compass).

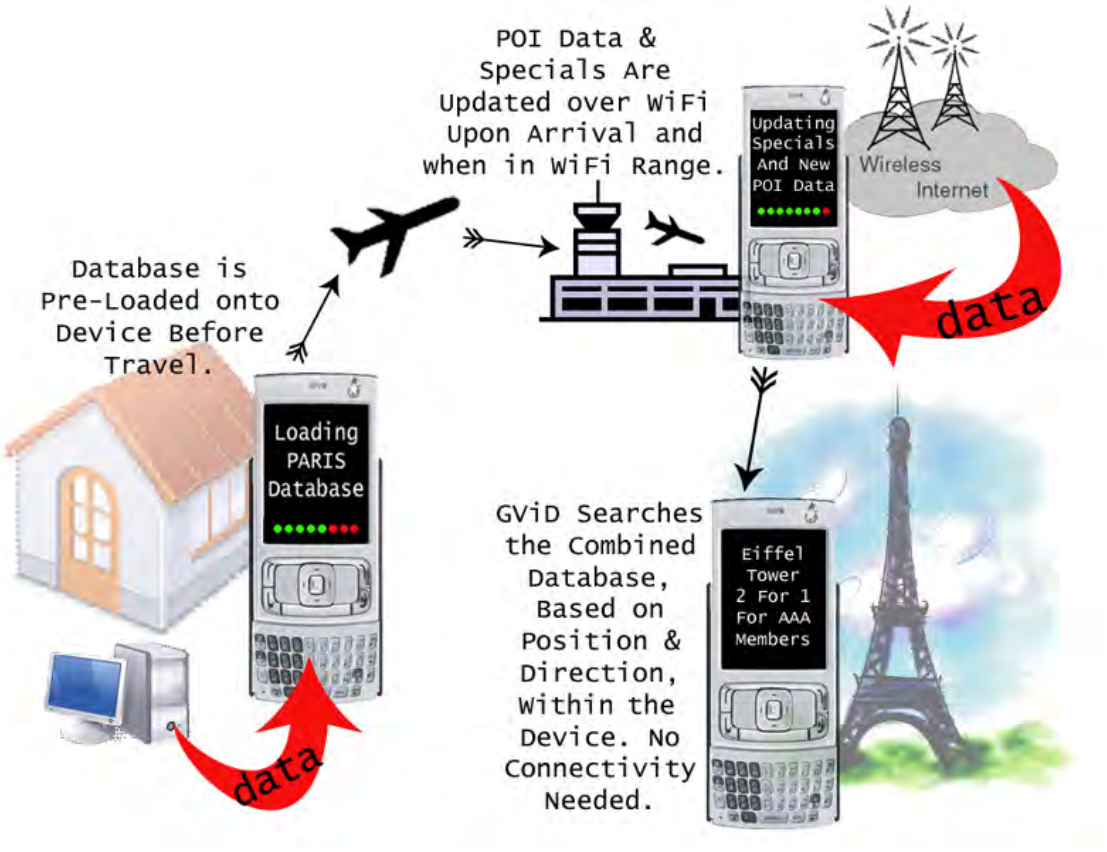
When the user points the device, the vector information (determined by knowing the position of the phone and the direction in which is it being pointed) identifies the targeted object or objects in a database. The object database is in internal memory and can be updated as needed when interfacing with a server using the IP network to communicate.

The GeoVector software, which uses the position and direction data to create the vector which intersects objects in a database, is referred to as GViD™. GViD holds a basic set of information each object: the name, position and category. This allows the application to sort results by category and show the direction and distance to the object. If the user requires additional information about the object, the application accesses that data from the internal database or launches a web browser and retrieves the additional information specific to that object from appropriate Internet sources.

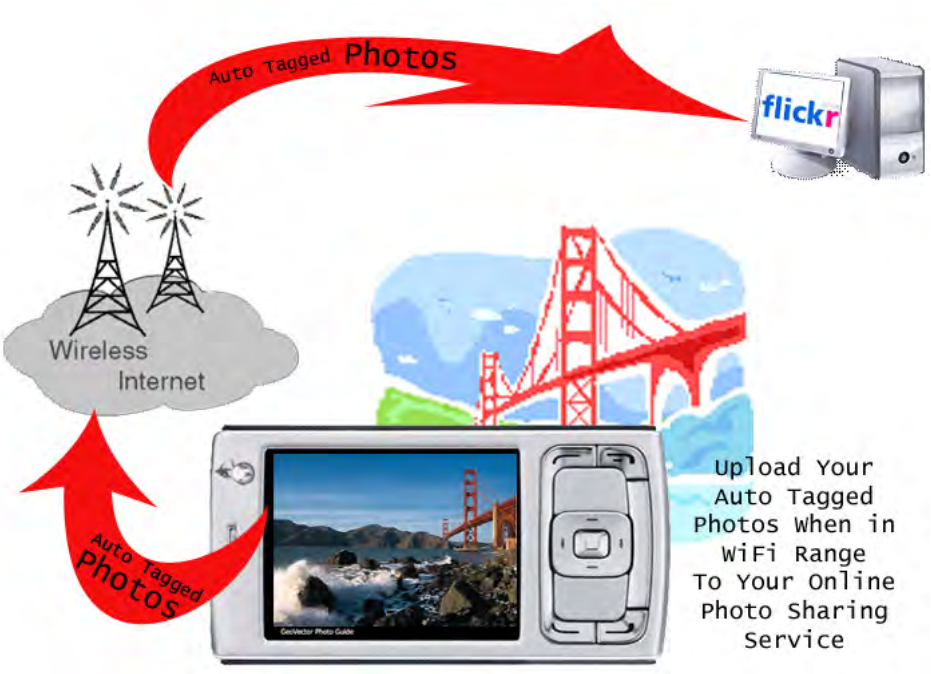
This is a diagram of a GeoVector directed pointing search. The vector created by knowledge of position and direction of the device intersects with objects of various sizes and shapes. This intersection identifies the object as the target and returns information about it to the user. The width of the angle and the range of the search are both under user control.



Data Flow from Home Base to WorldSurfer:



Data Flow from WorldSurfer to Home Base:



GeoVector's Enhancements to Advertising

GeoVector's pointing based search solutions provide a pull-based, user requested, authenticated and unobtrusive link between advertisers and their target demographic. It is a natural and immediate "opt in" system, responsive to users at the exact moment when they require information. Advertising is delivered when the user points at a billboard or a business. The advertising can also come in the form of banner ads placed into an application that have a direct contextual relevance to a pointing search. For example, the system can customize banner service based on the knowledge that a user is pointing at restaurants.

Also, location based advertising can be integrated directly into local search applications that the GeoVector platform supports. A user looking for a particular type of store (shoes, restaurant, etc.) can be presented with an ad relating to both the type of store and their location.

Pull, User Requested & Unobtrusive Advertising

The advertising in pointing applications is driven by the user pointing at an object and asking for more information. It's the mobile and localized equivalent of opening the yellow pages. The user is not randomly interrupted by useless information but is provided with the information he needs just when he requests it.

The user, who has demonstrated both interest and proximity, is a very highly qualified prospect. He will regard offers presented at this time as a convenience, rather than an annoyance, and will be more inclined to take advantage of them.

Historically a targeted, well qualified and interested audience has commanded premium advertising fees and that is exactly what GeoVector's pointing interface system can provide.

Sample Application Concept Images

Get information About the City by Pointing the Device and Be Guided to Destinations

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Find Transportation Information by Pointing

Update Device's Data Based on GPS or by Known Wi-Fi/WiMax Hotspot Position

Explore Restaurants and Learn Local Customs by Pointing

Document Control: GeoVector and Partner Confidential
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Connect with Retailers by Pointing

Get Photos of all the Sights & Be Guided to Most Interesting Photographic Subjects

Document Control: GeoVector and Partner Confidential
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The camera can suggest the best time of day, and even the best position and angle for the shot.

Automatically Tag and Upload Images to an Online Photo Service
The Camera knows where it is and where it's pointing – so it knows the photo's subject

Live the History of your Surroundings
Point to see the World as it Once Was from your Current Perspective

Play Real World Immersive and Interactive Games by Pointing